AVIATION WEEK

NOV. 1, 1954

50 CENTS

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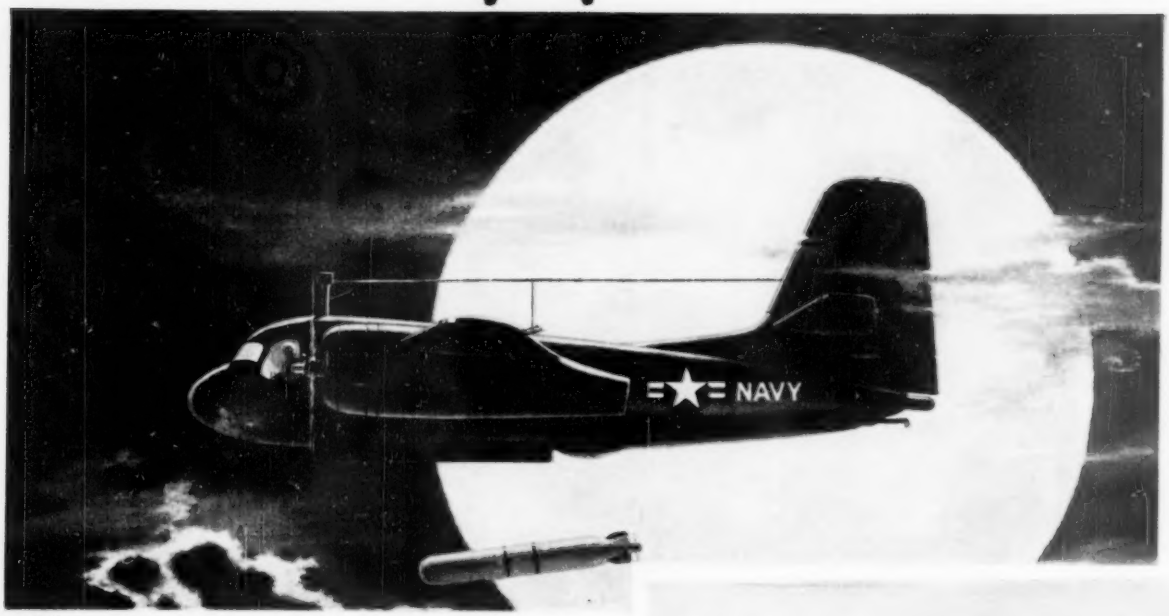

S2F

From tin fish to censored

The TBF Avenger was built to deliver tin fish to surface ships. This she did with alacrity during World War II. She also corked harbors with mines, sought subs and sank 'em. The new S2F is more a submarine specialist. Filled with electronic gear that detects, plots, and pin-points an unseen sub, she can drop a *censored* charge that will guarantee "point of no return" for the sub. The S2F is the latest of a long line of highly effective aircraft designed and built for the U. S. Navy.

Grumman

GRUMMAN AIRCRAFT ENGINEERING CORPORATION

BETHPAGE • LONG ISLAND • NEW YORK

DESIGNERS AND BUILDERS ALSO OF THE NEW SUPERSONIC TIGER, ALBATROSS AMPHIBIANS, METAL BOATS, AND AEROBILT TRUCK BODIES

AVENGER

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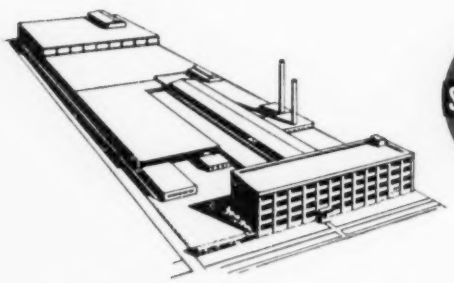
SUNDSTRAND AVIATION DOUBLES PRODUCTION CAPACITY



SUNDSTRAND

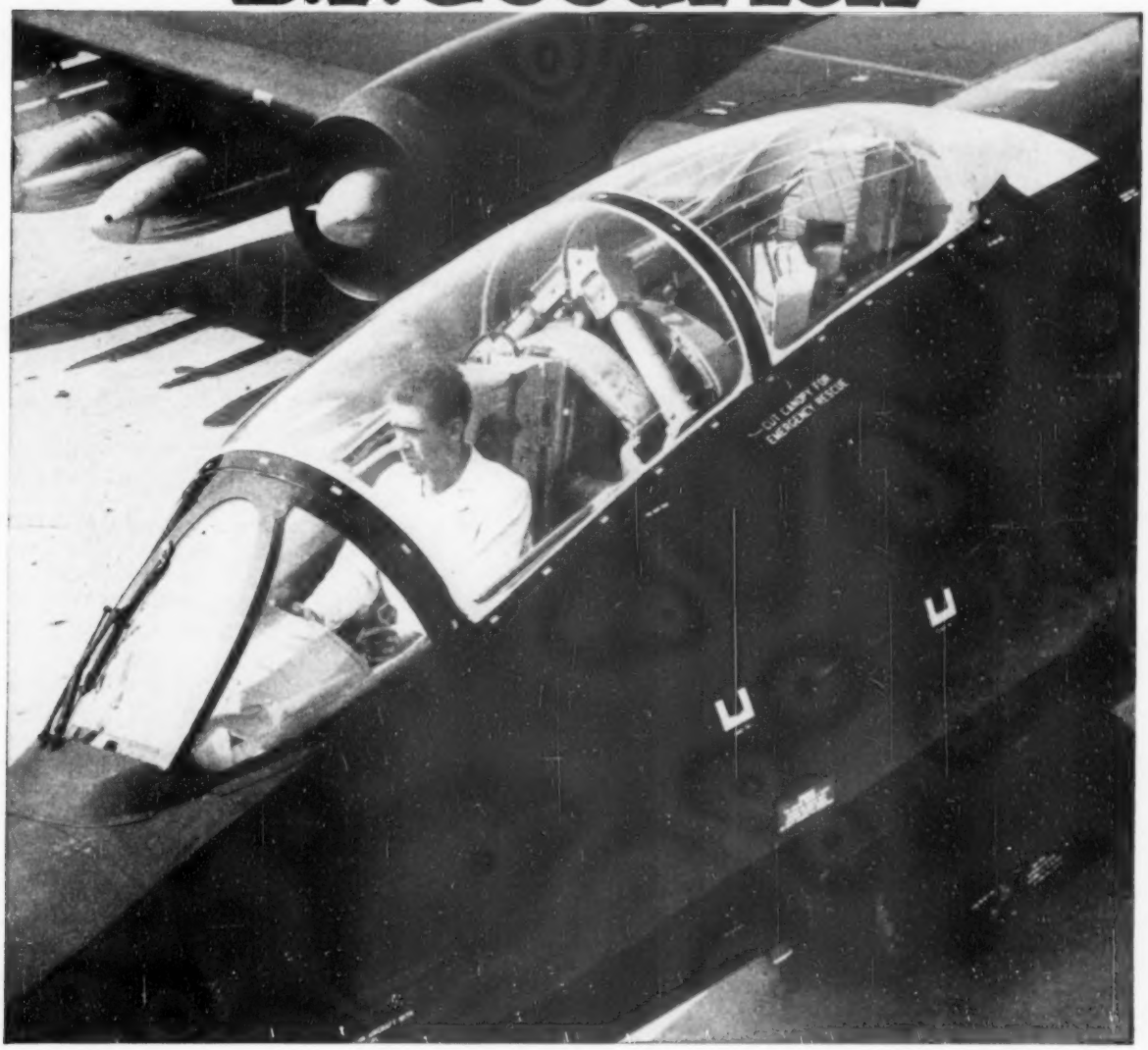
Sundstrand Aviation is now the sole occupant of a 250,000 square-foot facility devoted to production of Sundstrand Constant Speed Drives for the aircraft industry. The move, which doubles production capacity, reflects Sundstrand Aviation's continuing policy of providing facilities to meet current commitments, as well as to anticipate future demands of the Air Force, the Bureau of Aeronautics, and engine and airframe manufacturers for the pioneer constant speed drive. It comes hard on the heels of the announcement made earlier this year of Sundstrand Aviation as a separate division of Sundstrand Machine Tool Co. And it is to be followed by other expansion moves, now in planning stages, which will provide additional facilities to meet the ever increasing demand for Sundstrand Constant Speed Drives.

SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS • Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



We're for never blowing bubbles

THE BUBBLE TYPE CANOPY on the new Martin B-57B light bomber had to be safely pressurized at altitudes of 8 miles and higher. Ordinary inflatable seals between the bubble and cockpit might blow out from the effect of high pressure inside the canopy and low pressure on the outside.

B. F. Goodrich engineers had a ready-made answer to the problem—their inflatable strip seal. It has a U-shaped solid rubber base and a rubberized fabric diaphragm nested inside the base. When inflated, this diaphragm simply *lifts* to seal effectively. Low inflation pressure gives full expansion with very little or no stretch. Of course, less stretch means less strain. It works like blowing up a paper bag so that dangerous stretching, like blowing up a toy balloon, is eliminated.

The new inflatable strip seal works almost instantly. Even at minus 65°, it inflates with approximately the same pressure that ordinary seals needed at room temperature. There are other advantages. It fits around complex curves. It seals and unseals quickly. Sliding wear and scuffing are minimized because of high clearance when seal is deflated.

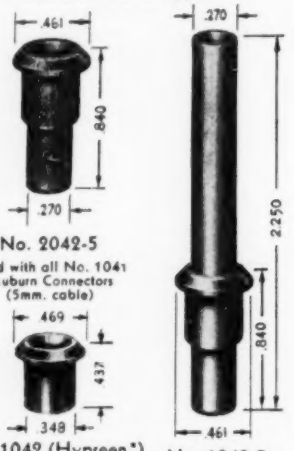
The new B. F. Goodrich seal is now in use on more than a dozen makes of planes, including latest jet fighters and bombers like the F-100 and B-57.

Other B. F. Goodrich products for aviation are tires, wheels, brakes; De-Icers; heated rubber; Pressure Sealing Zippers; Avtrim; fuel cells; Rivnuts; hose; other accessories. *The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER

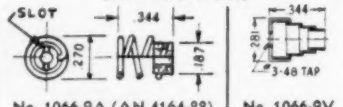
Auburn
IGNITION ACCESSORIES

Terminal Collars (Seals)
Ozone Resistant Hypreen*



*Auburn Synthetic Rubber

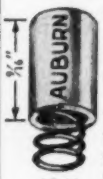
SPRING AND EYELET ASSEMBLIES
(Used with 3-48 Stud)



Teflon Connectors
with Inconel volute springs

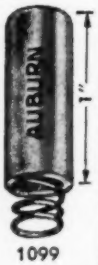
1041-TV (9/16")
1099-TV (1")

Connectors with stainless steel coil springs



1041-C Steatite
1041-M Mycalex
1041-D Alumina
(AN 4164-2)

1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina
(AN 4164-1)



1041 1099

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DOW

MAGNESIUM SHEET and CASTINGS cut dead weight for KAMAN AIRCRAFT

New aid to tactical and mercy missions for the naval service is being supplied by the Kaman Aircraft Corporation's Navy HTK-1 helicopter—a three-place machine, convertible to an aerial ambulance.

Kaman designers have taken advantage of magnesium's high strength/weight ratio for power transmission castings, and of the excellent rigidity of magnesium sheet for the entire skin section. Service conditions and load requirements for the most efficient "carrying capacity" are thus met by lightweight magnesium.

Many aircraft designers today are utilizing magnesium to simplify design and reduce fabrication costs—a trend that is growing with expanded Dow production facilities. Mill products are now being produced in sizes and quantities never before possible. Price reductions in magnesium sheet and plate also make this metal practical for many applications never before considered.

Write today for more information about magnesium. THE DOW CHEMICAL COMPANY, Magnesium Sales Department, Midland, Michigan.

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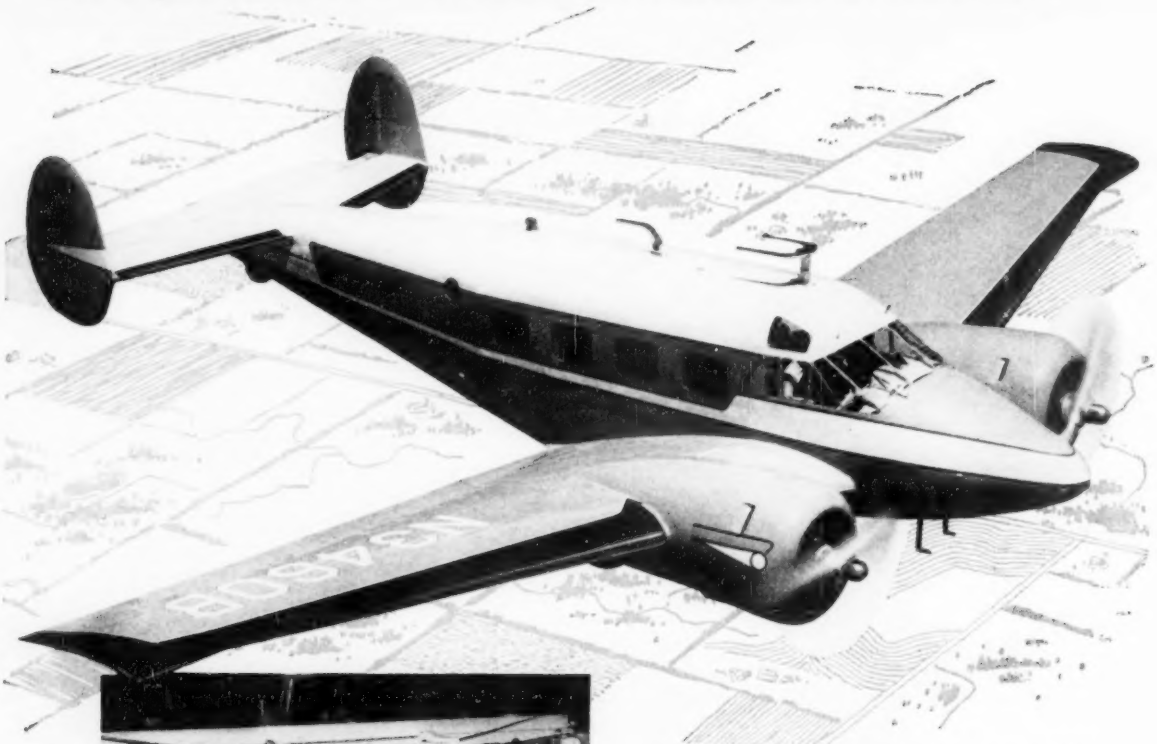
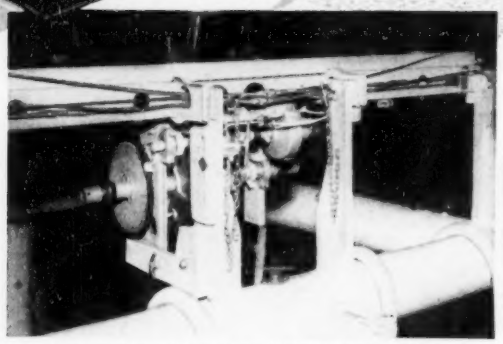
DOW

New 8-Place Beechcraft "Super 18" outperforms famous wartime model!



The new 8-place Beechcraft "Super 18" cruises at 215 m.p.h., has a range of 1,455 miles.



Macwhyte "Hi-Fatigue" cables are being installed, and the assembly is on a jig in this view showing aileron controls. Photo was taken at floor board level.

Beech Aircraft selects Macwhyte "Hi-Fatigue" Cable for the "Super 18's" controls

The new Beechcraft "Super 18" Executive Plane boasts many new improvements over the Model 18, the predecessor that saw so much wartime army and navy service. *Controls on both these Beechcraft models are operated with Macwhyte "Hi-Fatigue" aircraft control cable.*

The 8-place, twin-engine executive transport has a maximum speed of 234 m.p.h., a cruising speed of 215 m.p.h., and a range of 1,455 miles. The "Super 18" boasts a higher service ceiling than the earlier model, a better rate of climb and single engine performance, and a greater gross weight of 9300 lbs.

The 550-lb. increase in gross weight gives the "Super 18" a higher payload, but the installation of jet-type exhaust stacks, redesigned wing tips, and other aerodynamic modifications boost the performance without cost of extra fuel.

The wide use of Macwhyte "Hi-Fatigue" Cable by Beech Aircraft and other leaders in the aircraft industry is a testimony to its long record of safe and dependable service.

Write for more information on Macwhyte Aircraft products. Specify Catalog A-2.

MACWHYTE

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"Hi-Fatigue" is a registered trademark. Member A.D.M.A. and A.I.A.

NEWS DIGEST

Domestic

Snark XB-62, Northrop Aircraft's longrange pilotless bomber, is showing "encouraging progress" in development, the builder reports. Northrop also says it is carrying out a joint proving program with the Air Force at USAF's Missile Test Center at Cocoa, Fla.

Prototype F9F-9 Tiger crashed Oct. 19 near Grumman Aircraft Engineering Corp.'s Peconic, N. Y., plant during an unsuccessful attempt to make the field after a flameout at about 8,000 ft. The Navy test pilot was injured but walked away from the crash. Grumman's second F9F-9 now is flying.

Turboprop Convair R3Y-2 bowloader seaplane made its first flight Oct. 22 at San Diego, logging 1 hr. 23 min.

Dr. George T. Baker, professor of transportation at the Harvard Graduate School of Business Administration, one-time member of Civil Aeronautics Board and vice president of the President's Air Policy Commission in 1947, is the new president of Transportation Association of America. He succeeds Frank C. Rathje, who retired.

Sikorsky Aircraft's new Army contract for H-37 cargo helicopters (AVIATION WEEK Oct. 18, p. 14) totals $64 million.

Fire control systems will be manufactured for the Army under new contracts awarded to Western Electric Co., General Motors Corp.'s A.C. Spark Plug Division and Sperry Gyroscope Co. The awards: Western Electric, $24 million; A.C. Spark Plug, $17 million, Sperry, $17 million.

Financial

Douglas Aircraft Corp., Santa Monica, Calif., reports net earnings of $28,190,796 for the first nine months of fiscal 1954, more than doubling the $13,325,773 net for the same period last year. Net sales totaled $699,530,840, compared with $632,280,525. Backlog Sept. 30: $1,853,680,530.

Glenn L. Martin Co., Baltimore, had a net income of $14,506,087 for the first nine months of this year, compared with $7,365,843 for the same period of 1953. Sales climbed to $187,178,497 from $116,904,036. The company has declared its first dividend in eight years: $1 plus a 10% common stock dividend, payable Dec. 15 to holders of record Nov. 8.

American Airlines' net profit for the first nine months of 1954 totaled $5,465,000, dropping from $10,987,000 for the first three quarters of 1953. AA blames the loss in part on the 24-day pilots' strike last August (AVIATION WEEK Aug. 30, p. 52). Revenues were $154,480,987, compared with $155,698,284.

Northrop Aircraft, Inc., Hawthorne, Calif., had a consolidated net income of $3,829,387 for the fiscal year ended July 31, compared with $2,338,359. Sales and other income dropped to $171,666,343 in fiscal 1954 from $184,230,017 last year. Consolidated backlog July 31: approximately $512 million.

Cessna Aircraft Co., Wichita, reports sales of $45.1 million for fiscal 1954, an increase of $1.6 million over 1953. Backlog Sept. 30: $35 million. The company has declared an extra 25-cent dividend plus a regular semi-annual payment of 25 cents, payable Dec. 13 and 15 respectively to stockholders of record Dec. 7.

Piper Unveils Business Planes for 1955

Piper Aircraft Corp. is standardizing on one type of engine—the 150-hp. Lycoming—for all three of its business planes for 1955. The new models, shown in echelon at 9,000 ft. are (top to bottom): twin-engine Apache, Tri-Pacer and Super Cub. The latter pair previously had the 135-hp. Lycoming. Because of preponderant demand for the Tri-Pacer, the company has discontinued production of its sister ship, the Pacer. Apache basic price remains at $32,500; the Tri-Pacer and Super Cub each up $350 to $6,825 and $5,445, respectively, because of the more powerful engine.

International

Vickers-Armstrongs has agreed, at the suggestion of Britain's Air Registration Board, to conduct combination wing bending and pressurization tests to destruction on a Viscount transport. Company is building its own test tank and will bear complete costs—including loss of one Viscount. The action results from the Comet court of inquiry (see p. 16).

Turboprop Vickers Viscount crash-landed at Rome last week after its port landing gear failed to retract on take-off, claimed by British European Airways as the transport's first mishap since it went into service on BEA routes 19 months ago. Press reports said the gear buckled during the emergency landing, and the turboprop transport slid off the runway. None of the 36 persons aboard was injured.

British government, according to Paris reports, has offered Air France and UAT 12 Vickers Viscounts plus spares in return for their Comet 1s. Each airline originally had three Comet 1s.

Cruzeiro DC-3 crashed Oct. 21 in Rio de Janeiro's Gunabara Bay off the Santo's Dumont Airport, but all 32 persons aboard were rescued.

Prosper Cocquyt, 54, honorary chief pilot and helicopter consultant for Sabena Belgian airlines, died Oct. 21 in Brussels.

as others see us . . .

A user tells how AETCO SERVICE helped him

by V. L. GRAF, *President*, V. L GRAF CO.

"Many of our customers purchasing Hydraulic Hose Couplings for commercial use requested that we obtain Air Force-Navy approval for our reusable hose end fittings so they might use them for military equipment. Several of our customers were very anxious, especially for a ¾" Hose Coupling, designed to MS 28740 and meeting all the requirements of MIL-F-5070."

"In order for us to get some large orders, we had to get approval for the ¾" hose end quickly. We set our designers to work on a hose end that would meet the requirements of MIL-F-5070. After the coupling had been designed, several samples were made up and preliminary tests were conducted in our laboratory. The coupling having satisfied our preliminary test requirements, was now ready to undergo the test requirements of MIL-F-5070."

"In order that all the requirements of MIL-F-5070 be filled, we wanted to select a testing laboratory with the best and most modern equipment available and one who's results would not be questioned by Wright Air Development Center. Having had previous experience with AETCO, we chose them to do the testing for us. We stressed the fact that time was important."

"Within two weeks, the Wright Air Development Center was furnished a complete detailed report with photographs. As a result of the fast service furnished by AETCO, we were able to receive AN approval quickly, which resulted in some substantial orders for our company."

"AETCO since that time has completed several other tests for our company. We feel that they have the proper personnel, knowledge and equipment for testing hydraulic components and assemblies. We have been well satisfied and will use their facilities for testing, when necessary."

Aetco

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WHO'S WHERE

In the Front Office

R. W. Freeman, New Orleans businessman, is new board chairman of Delta-C&S Air Lines, succeeding **Carleton Putnam,** who resigned (AVIATION WEEK Oct. 25, p. 11).

Fred Hamlin, publisher of Aero Digest, has taken on additional duties as editor, succeeding **Robert McLarren** in that post.

Bruce A. Worcester has become president of West Coast Electronics Co., Los Angeles, and **Howard G. Grove** is new vice president in charge of military technical liaison and field service.

Herrol Bellomy has been appointed executive vice president and general manager of L. B. Smith Aircraft Corp. and Aerosmith, Inc., Miami, Fla. Other changes: **E. L. Martin,** comptroller; **Charles Lawson,** administrative assistant to Bellomy; **Mert Madden,** sales and service director.

Col. John C. Harvell (USAF Ret.) has moved up from assistant general manager of Electronics Corporation of America, Boston, to vice president in charge of the Military and Marine Divisions.

C. T. Foss, vice president-engineering of American Bosch Arma Corp.'s Arma Division, New York, has taken on additional responsibilities as assistant general manager.

Air Commodore F. R. Banks has been elected a director of Bristol Aeroplane Co., Bristol, England.

Changes

Capt. Marshall B. Gurney (USN Ret.) is director of General Bronze Corp.'s new Aero Division, Garden City, N. Y. Assistant director: **Cmdr. David V. Senft** (USNR).

L. R. Hackney, former executive vice president of Transport Air Group, has joined Fairchild Engine & Airplane Corp., Hagerstown, Md., as administrative assistant to the general manager of the Aircraft Division.

Val Cronstedt has resigned as engineering director of the Gas Turbine Division of A. V. Roe Canada, Ltd., Toronto.

George Bell, former general manager of Aero-Coupling Corp., has become manager of Resistoflex Corp.'s new West Coast plant at Burbank, Calif.

William S. Oman has been named sales director of Com-Air Products, Inc., Los Angeles.

Arthur S. Locke has been appointed associate director of Vitro Corporation of America's West Orange (N.J.) Laboratory.

Honors and Elections

H. B. Main, general traffic manager for Canadian Pacific Airlines, has been appointed world chairman of the International Air Transport Assn.'s Traffic Conference for 1955.

Paul Mantz, three-time winner of the Bendix Trophy, has won a certificate of aviation achievement from Wings Field, Ambler, Pa., for "outstanding contributions to aviation and advancements in aerial photography."

INDUSTRY OBSERVER

► Douglas, Lockheed and Convair have been prodded recently by C. R. Smith, president of American Airlines, for positive action on a turboprop transport suitable for domestic operators. Smith has been circulating specifications of what American wants in turboprop transport to the West Coast manufacturers. The American specifications resemble a four-engine Convair-Liner or a modernized Viscount.

► **Army is very interested in the bow-loading Convair R3Y-2 flying boat as an answer to its future amphibious assault and supply problems. Army planning indicates that future operations will require a flying LST capable of quick beachhead delivery with the ability to maneuver around areas where tactical atomic weapons are being used.**

► Lockheed's initial order for its F-104 day superiority fighter (AVIATION WEEK Oct. 18, p. 14) is for 17 planes. This will be the first increment to be built with production-type tooling for an extensive test program under the Cook-Craigie plan.

► **Hamilton Standard is going after the propeller market that is developing on relatively low-powered turboprops for airline transport use. A regular Hamilton Hydromatic reversible propeller now used on piston engines is being taxi-tested on the Allison T38-powered Turbo-Liner. Exploratory talks have been held with Rolls-Royce, Ltd., on the Rolls R.B. 109 turboprop being considered for several U. S. transport designs.**

► British European Airways is stimulating interest in applications of British turbines to Sikorsky copter designs to be built by Westland Aircraft, Ltd., under license. Among these possibilities are a commercial 20-passenger version of the S-58 powered by two Oryx gas generators, and a 35-passenger S-56 powered by two Eland 3,000-ehp. turboprops.

► **Lockheed is trying to interest the Air Force in a thin-wing version of the Super Constellation powered by four Pratt & Whitney T34s for radar picket plane duty. A commercial version of this design would be highly competitive with the Douglas DC-7D powered by Rolls R.B. 109 turboprops.**

► Convair's San Diego Division and Glenn L. Martin Co. are working in an informal coalition aimed at promoting the concept of water-based airpower to the military services. Close cooperation on ideas and free interchange of information enables company engineering teams to propose complementary designs to sell the program.

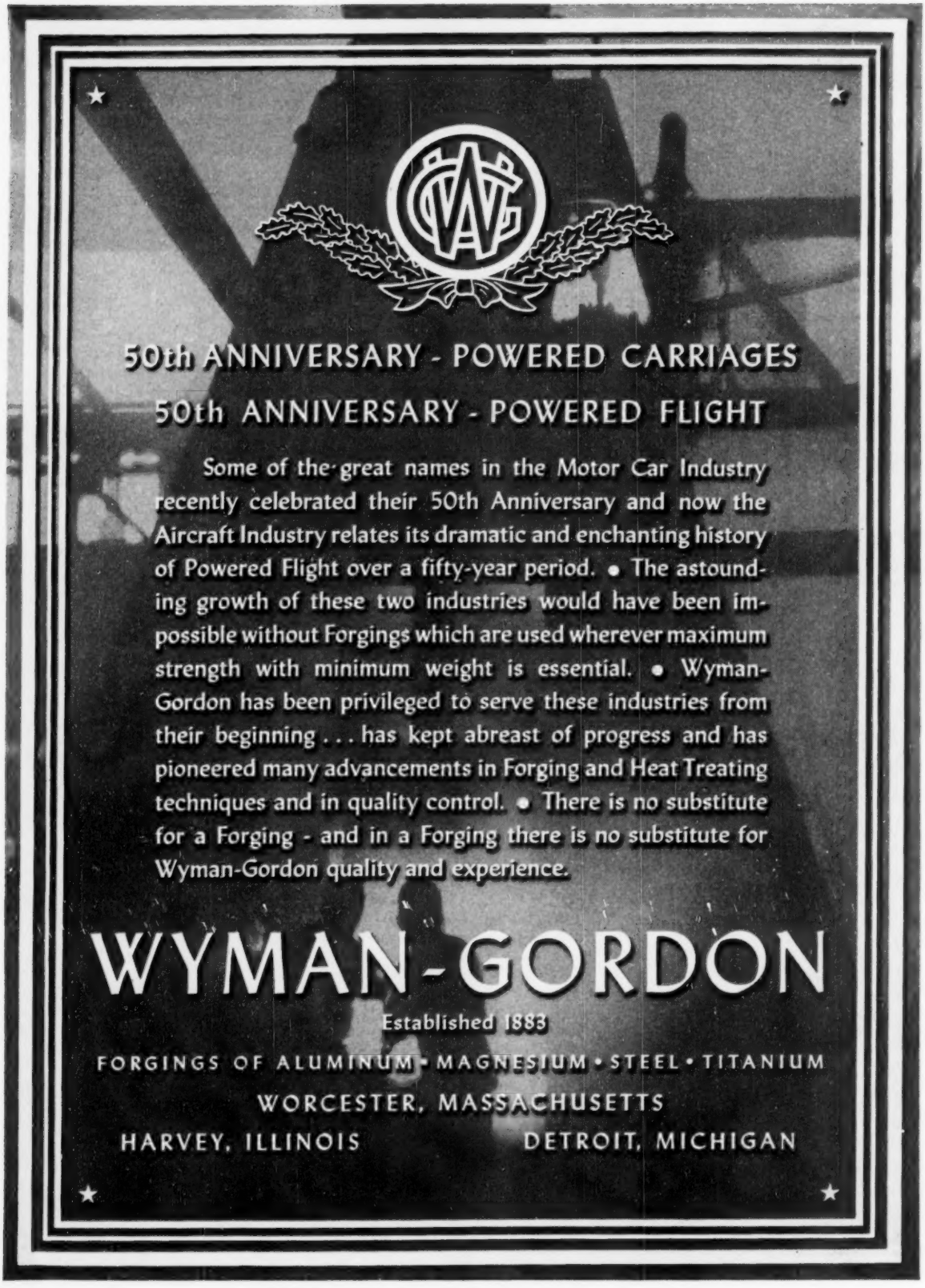
► **McDonnell Aircraft Corp. has received a $38-million contract for development of a new Navy carrier-based all-weather attack fighter. No official designation has been given the new plane yet although it probably will be the F4H or the AH-1.**

► Navy has canceled Bell Helicopter Division contracts for 57 HSL twin-rotor anti-submarine warfare helicopters. Bell will finish its original production contract for 78 HSL copters.

► **New missile research facilities are being constructed by Army Ordnance at its Redstone Arsenal, Huntsville, Ala., and the Air Research and Development Command at its Cocoa, Fla., missile test center. Sun Construction Corp. of Knoxville, Tenn., was awarded a contract for the $2-million research building at Cocoa.**

► Army currently is operating approximately 2,400 fixed-wing aircraft and 1,000 small helicopters, according to Col. W. B. Bunker, commander of the Army Transportation School at Ft. Eustis, Va. Army plans to expand its helicopter fleet with an additional 1,000 cargo copters in three classes: 3,000-lb.-payload Piasecki H-21C and Sikorsky H-34; 6,000-lb.-payload Sikorsky H-37, and 10,000-lb.-payload Piasecki H-16.

► **Navy has canceled the Pratt & Whitney Aircraft T52 turboprop development program. The T52 was planned as a split-compressor engine delivering about 8,500 ehp.**


50th ANNIVERSARY - POWERED CARRIAGES
50th ANNIVERSARY - POWERED FLIGHT
Some of the great names in the Motor Car Industry recently celebrated their 50th Anniversary and now the Aircraft Industry relates its dramatic and enchanting history of Powered Flight over a fifty-year period. • The astounding growth of these two industries would have been impossible without Forgings which are used wherever maximum strength with minimum weight is essential. • Wyman-Gordon has been privileged to serve these industries from their beginning . . . has kept abreast of progress and has pioneered many advancements in Forging and Heat Treating techniques and in quality control. • There is no substitute for a Forging - and in a Forging there is no substitute for Wyman-Gordon quality and experience.
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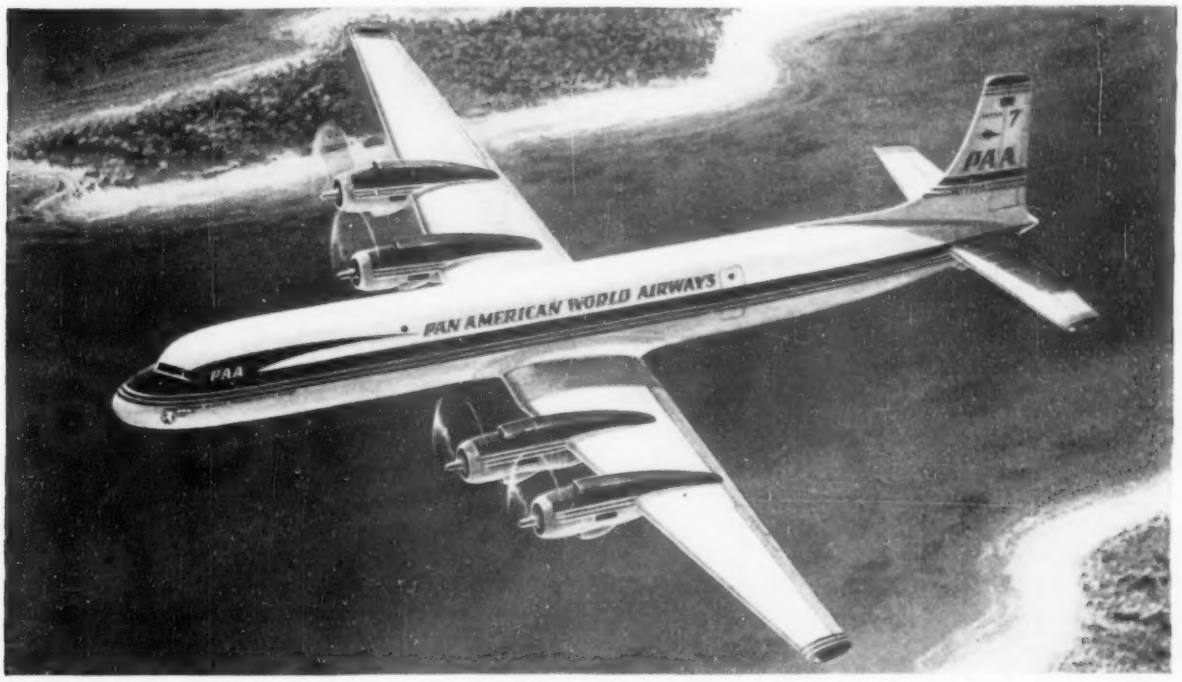


DOUGLAS DC-7C is shown here in Pan American World Airways markings proposed by Douglas. PAA, SAS and Swissair ordered plane.

DC-7C Challenges Turbine Transports

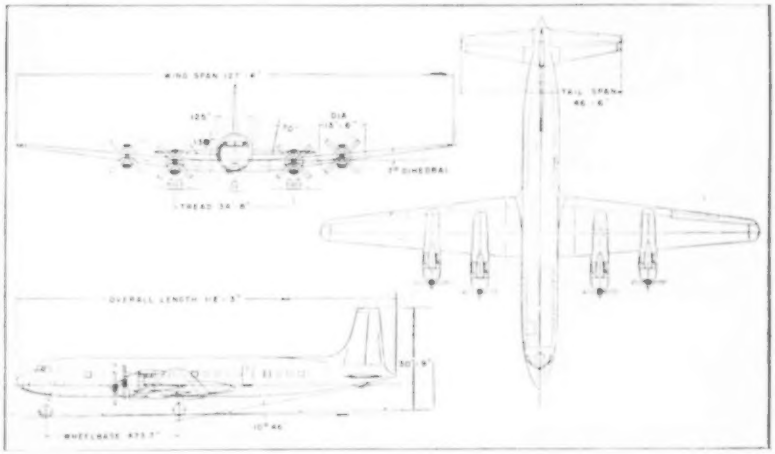
By David A. Anderton

Santa Monica, Calif.—Douglas Aircraft Co.'s DC-7C has flung a performance challenge to other transport manufacturers and to the airline industry.

Guaranteed performance figures for the 7C have forced airline operators to take another look at their fleet requirements for the next decade; have dared manufacturers of turboprop and turbojet transports to match its economy and even its point-to-point speed, and have forced grudging admiration from the competition, with the reservation that, of course, the competition has an answer coming right up.

With a solid order of 25 airplanes to lead off the production line, the Douglas company is offering the Seven Seas to other domestic and foreign operators for deliveries beginning in about three years.

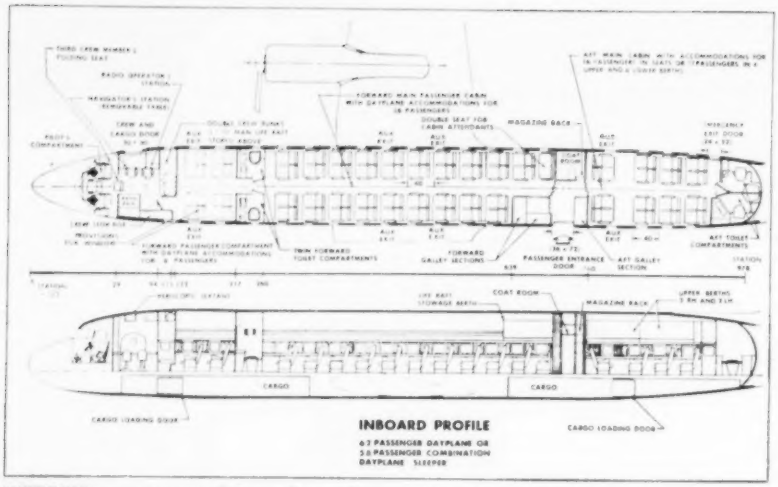
First to buy was Pan American World Airways, with an order for 15 airplanes. Scandinavian Airlines System announced next its order for eight, closely followed by a Swissair announcement of the purchase of two DC-7Cs.



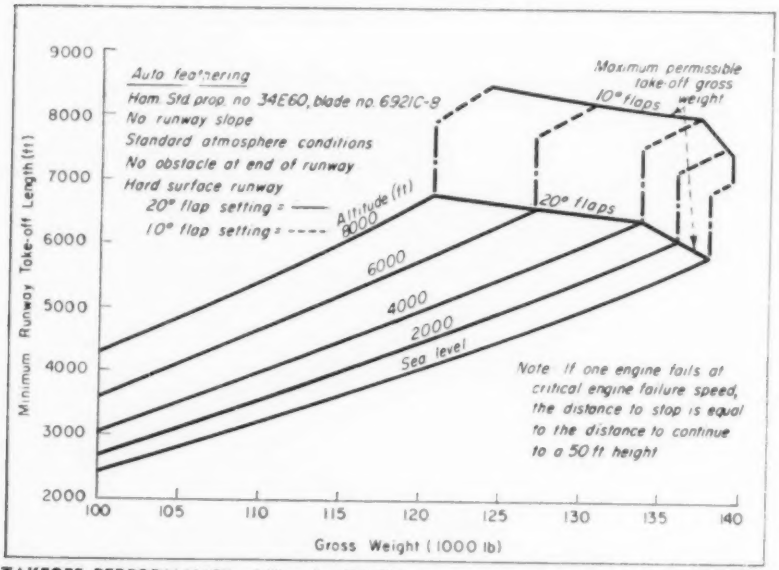
SEVEN SEAS three-view shows basic airframe changes from earlier DC-7 series. Span and length increases plus more power mean more payload, better operating economy.

► **Cost Plus**—For his $2¼-million investment per copy, the airline operator will get a 62-passenger airplane that will fly the Atlantic nonstop, either way, year-round. He will get an airplane with an easy operating range of 4,000 mi. and with possible operation up to 4,800 mi. He will be able to operate across the Pole to Europe, fly the Pacific nonstop, make coach runs from Chicago to Europe nonstop.

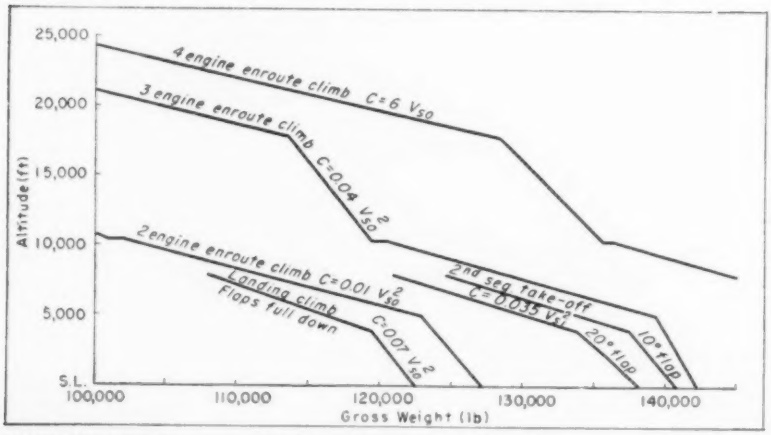
He will get an airplane that will be



INTERIOR arrangement of Seven Seas will vary with customer needs; layout shown here is standard arrangement proposed by Douglas for day plane or sleeper service.



TAKEOFF PERFORMANCE of Douglas DC-7C shows runway lengths required at various gross weights and airport altitudes. Data is based on dry rating of engines.



LIMITING WEIGHTS as restricted by climb and takeoff performance are delineated in this chart of DC-7C performance. Engine horsepowers are dry ratings.

familiar to his pilots and mechanics, although the airframe and Wright Turbo Compound powerplants are new, in the engineering sense.

His passenger-payload break-even load factors for overseas flights will be about 26%, and about 31% for domestic runs. Direct operating costs per mile will be about $1.45 for overseas operations and $1.28 for domestic, based on Douglas calculations (said by the company to be a little tougher than the standard Air Transport Assn. method).

There will be one additional dividend over and above all this: The cabin will be quieter, because of the 10-ft. center-section addition to the wing, which moves each engine five feet further outboard. This should eliminate one of the few criticisms of current DC-7s.

▶ **New, But Familiar**—In an exclusive interview with AVIATION WEEK, J. R. McGowen, Douglas' chief project engineer for the DC-6 and DC-7 series, described the basic design and engineering features of the upcoming DC-7C.

"We're about in the middle of the design now," said McGowen, "and we expect the first flight in December 1955. By late spring of 1956 we will deliver the first plane to Pan American, and they will probably have it in service in the summer.

"The basic structure is almost completely new," he added. "When you stretch an airplane, you redesign just about everything to the new load factors. But the airplane will be familiar to airline maintenance people, because the kind of work they will have to do doesn't get into basic structure."

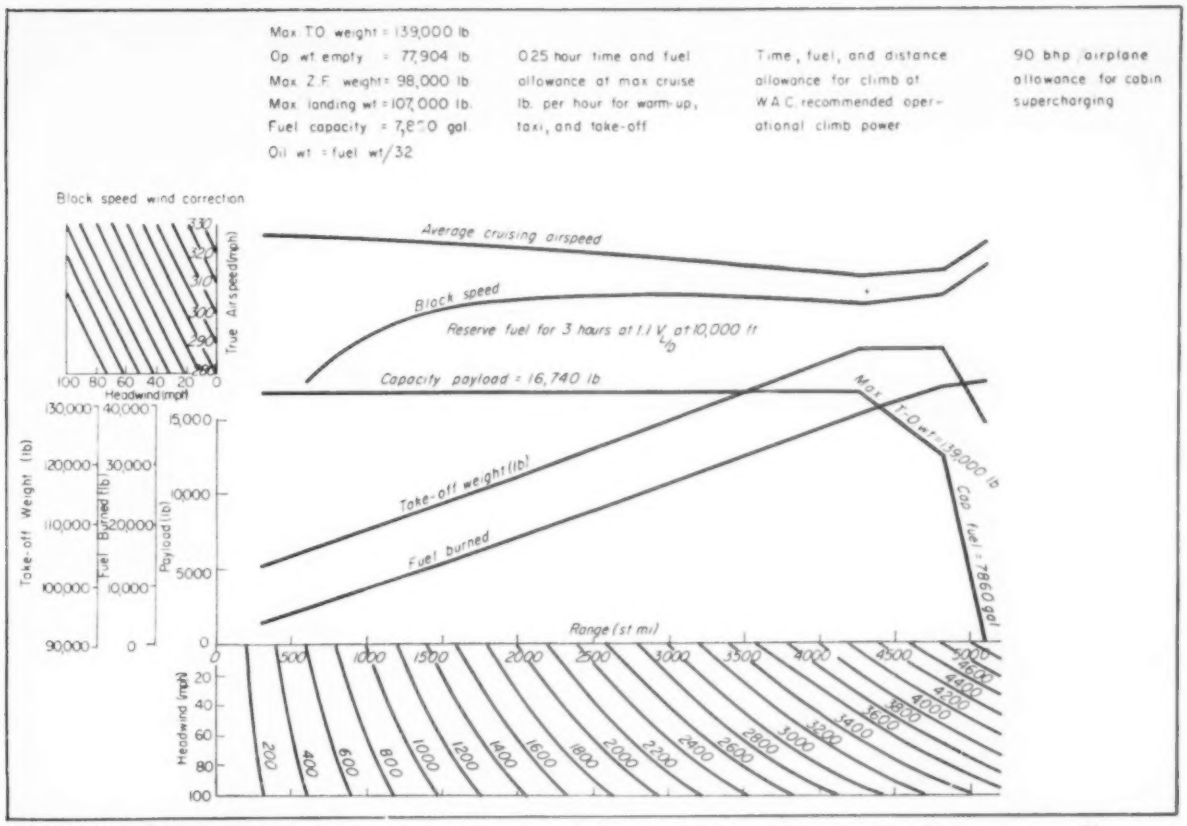
▶ **Basic Layout**—The Seven Seas ("God, how I envy them that name!" said the vice president of another company) is basically a stretched DC-7B, which was in turn a stretched DC-6B.

Span of the DC-7C has been increased by the addition of a 10-ft. center section between the wing roots, raising the wing area to 1,637 sq. ft., and the wingspan to 127 ft. 6 in. Fuselage length, increased 40 in. over that of the DC-6B in the basic DC-7, has been pulled out another 40 in. ahead of the wing, to give a total fuselage length of 112 ft. 3 in. Height of the vertical tail has been increased by about two feet to a new figure of 30 ft. 9 in.

Powerplants were switched for the DC-7 series from the Pratt & Whitney R2800 to the Wright Aeronautical R3350 Turbo Compound. The Seven Seas will be powered by four Wright R3350-EA1 engines swinging four-blade Hamilton Standard props.

Fuel capacity is 7,860 gal.; the additional capacity comes from the extra center section.

Maximum gross weight of the 7C is currently at 139,000 lb. for performance figures, 140,000 lb. for structural design.


Max TO weight = 139,000 lb
Op wt empty = 77,904 lb
Max Z.F. weight = 98,000 lb
Max landing wt = 107,000 lb
Fuel capacity = 7,860 gal
Oil wt = fuel wt/32
0.25 hour time and fuel allowance at max cruise lb. per hour for warm-up, taxi, and take-off
Time, fuel, and distance allowance for climb at W.A.C. recommended operational climb power
90 bhp airplane allowance for cabin supercharging
Block speed wind correction
True Airspeed (mph)
Headwind (mph)
Average cruising airspeed
Block speed
Reserve fuel for 3 hours at 1.1 V_MD at 10,000 ft
Capacity payload = 16,740 lb
Max T.O. wt = 139,000 lb
Take-off weight (lb)
Fuel burned
Max fuel = 7860 gal
Take-off Weight (lb)
Fuel Burned (lb)
Payload (lb)
Range (st mi)
Headwind (mph)

TYPICAL PAYLOAD-RANGE chart for Seven Seas shows cruise operation at 15,000 ft. altitude and 1,700 bhp. per engine. Figures are taken from latest available technical performance and weight handbook for the DC-7C airplane.

► **Powerplant Details**—The new EA-1 version of the proven Wright Turbo Compound engine has a guaranteed takeoff rating of 3,400 bhp., and guaranteed maximum cruise powers of 1,910 bhp. at 11,600 ft. altitude in low ratio, and 1,800 bhp. at 20,600 ft. in high ratio.

Designation of the engine is Model 988TC18EA-1; it corresponds roughly to the R3350-32 military engine, although there are considerable detail design changes. The engine itself is in an advanced state of design, with construction of the first units to begin soon.

The EA-1 is a logical development of the DA-3 and DA-4 series of Turbo Compounds; the design changes have been chosen to provide increased power and increased durability, says Wright.

Design rating of the engine series is for 4,000 bhp., which leaves margin for power increases over the next few years. In the nose section, the reduction gearing and torquemeter adapter have been strengthened. Crankcase diaphragms and modified pistons have been beefed up for increased power and life.

Cylinders have been modified, as have the inner valve springs and exhaust valve guides, to give increased life and to handle the extra power. Valve material has been changed for increased strength at operating temperature plus increased life.

► **More Changes**—In the turbine section, the adapter, support and the complete turbine assembly have been revised with the aim of increasing turbine life. Plumbing in that section has been improved for the same reason, and also to make for easier maintenance and disassembly.

The impeller drive has been modified, and increased capacity has been built into the pressure oil pump and oil filter.

The distributor flanges have been strengthened, for trouble-free attachment. Advance timing of 30 deg. is incorporated to reduce the cylinder-head operating temperatures and therefore to increase combustion chamber life. Fuel injection pumps are now flush mounted, for easier maintenance and overhaul, and the CB type fuel injection nozzles have been specified for the new design to give an optimum fuel distribution in the combustion chamber.

These changes comprise the major portion of a list currently in effect on the design of the EA-1; the list will not be finalized until completion of the engine type certification test, now scheduled for July 1955.

Propeller design calls for Hamilton Standard 6921C-8 blades; final diameter of the prop will depend on company flight tests. The available three-view drawing shows a 13 ft. 6 in. diameter, but this figure could go as high as 14 ft. 2 in. if tests prove the need.

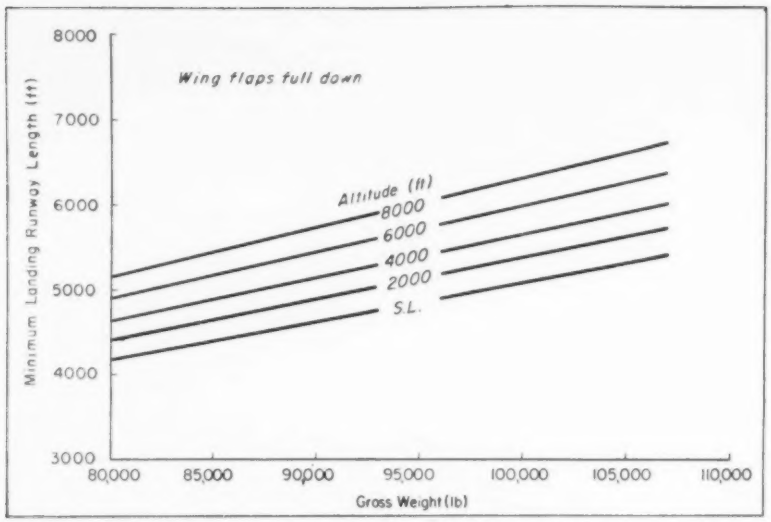
► **Interiors**—Standard passenger layout

Douglas DC-7C

Typical Loading

Manufacturer's weight empty	72,515 lb.	
Operating items (crew, cabin equipment, etc.)	5,402	
Operator's weight empty		77,917
Fillet oil fluid*	176	
Payload (space limited)		
62 passengers at 165 lb.	10,230	
Cargo at 10 lb./cu. ft.	6,510	
Zero fuel weight with space-limited payload		94,833
Nacelle oil at 55 gal. each	1,650	
Fuel (7,086 gal.)	42,517	
TAKEOFF GROSS WEIGHT		139,000 LB.
Payload (weight limited)		
62 passengers at 165 lb.	10,230	
Cargo at 15.14 lb./cu. ft. (13,440 lb. max.)	9,853	
Zero fuel weight (maximum)		98,000
Nacelle oil	1,650	
Fuel (6,558 gal.)	39,350	
MAXIMUM TAKEOFF GROSS WEIGHT		139,000 LB.

* Fillet oil required when fuel load exceeds 6,600 U.S. gal.



RUNWAY LENGTH requirements are shown for changes in DC-7C gross weight and altitude of destination airport. Landing distance is 60% of runway length.

provides two-abreast seating for 62 passengers in three major sections: eight in a forward compartment, 38 in the main cabin and 16 in the aft cabin. For sleeper service, an alternate arrangement of the rear compartment accommodates 12 passengers in four upper and four lower berths (four of the berths are doubles).

Four toilet compartments—two forward, two aft—plus a galley and coatroom complete the interior of the cabin.

Up front, there are five working crew stations and two bunks. Two stewardesses comprise the rest of the normal crew.

High-density interiors vary in capacity from 80 to 95 passengers, depending on what the airline customer wants. Cargo capacity of 651 cu. ft. is provided beneath the floor of the main cabin, with loading doors fore and aft in the conventional fuselage-belly locations.

▶**Design Differences**—"The fundamental change is the center section addition," says McGowen. "This gives the improvements that come with increased wing area and aspect ratio, plus extra fuel space and the increased comfort we gain by having the props further outboard. Combine these advantages with those you get from increased power and you've got a near-optimum piston-engined airplane."

Power, span and area increases show up in the increases in limiting weights. For a given range problem, the larger wing area means decreased takeoff distance. Climb after takeoff picks up because of the power boost and the increased span. Span also increases the specific range for maximum range operation.

Cruise speeds are about the same as the DC-7B, the company says, with some improvement at the higher gross weights. Landing distance is reduced appreciably by the extra wing area, again for a given range problem.

Most of the increased gross weight was used by Douglas engineers to get more fuel into the airplane.

▶**Typical Trips**—McGowen points out some of the possible routes that could be flown by the Seven Seas. "Look at Paris to New York," he says. "In the DC-7B, cruising at 1,700 bhp. per engine and 15,000 ft., we'd need a tailwind of 50 mph. and we'd just make it. With the Seven Seas, we could make it against a 30-mi. headwind, or against a 40-mi. headwind in longrange cruise configuration, with a capacity payload. Over that same route, we could carry maximum cruise power for more than half the runs and make it.

"If you want to stop at Shannon en route, then you could make the run back from Shannon to New York at maximum cruise power against a 70-mph. headwind with a capacity payload," McGowen adds.

"With this kind of range, the pilot can choose his course and can save a lot in headwinds," he states. "Besides, it would make it ridiculous not to fly across the Pole; it's possible to see nonstop operations from Seattle to Europe."

▶**Airline Urging**—McGowen gives two airlines—American and United—the credit for backing the development of the DC-7 series.

Douglas engineers started with the basic DC-6B configuration and spliced in an extra 40 in. of fuselage aft of the wing. Increased load capacity and design speeds made a structural beefing mandatory all over the plane. Other design changes from the DC-6B included: new escape door added in the rear, titanium nacelles, speed brakes working up to an indicated speed of 300 mph., new Wright Turbo Compound engines replacing the P&WA R2800s, four-blade props, and decreased rudder forces.

This was the version designed—and bought—for blue-ribbon domestic service. But it wasn't the end point; Douglas and the airlines were looking for the same kind of service for overwater flights. This search led to the DC-7B.

▶**Basic Changes**—More power and fuel were the basic changes in the 7B. New Wright engines—DA-4s—replaced the earlier versions, giving a 100-hp. increase per engine at normal rated power. Nacelles were extended to the trailing edge of the wing, and their contours modified. Inside the new-found space, extra fuel cells boosted the range figures; the 5,512-gal. capacity was upped to 6,490 gal. There was an aerodynamic dividend when the lengthened nacelles paid off in decreased drag.

New flaps were designed for improved takeoff characteristics. There wasn't anything particularly wrong with the old configuration except for takeoff; the gaps were poor and there was no slot effect for low deflections of the flap. Douglas engineers knew this, but didn't much care because takeoff wasn't critical.

But increased gross weights forced the change. The new flap works off a walking-beam linkage which moves the flap hinge line aft, up and then down to

Wright Turbo Compound
WAC Model 988TC18EA1
Basic Specifications

Engine displacement	3,350 cu. in.
Engine dry weight, ±1%	3,609 lb.
Maximum overall length	89.53 in.
Maximum diameter	56.59 in.
Reduction gear ratio	0.4375
Supercharger ratios	5.46:1
	8.67:1
Compression ratio	6.70:1

RATINGS	BRAKE HORSE-POWER	CRANK-SHAFT RPM.	ALT. FEET
Takeoff (5 minutes)			
Low ratio	3,400	2,900	S.L.
Low ratio	3,400	2,900	4,000
High ratio	2,550	2,600	18,700
Maximum continuous			
Low ratio	2,800	2,600	S.L.
Low ratio	2,850	2,400	4,300
High ratio	2,450	2,600	17,900
Cruise power (recommended maximum)			
Low ratio	1,910	2,400	11,800
High ratio	1,800	2,400	20,600

FUEL CONSUMPTION AT	OPERATING SPECIFIC FUEL CONSUMPTION—LB./BHP.-HR.
Takeoff power	
Low ratio—sea level	.680
Low ratio—critical altitude	.674
High ratio—critical altitude	.633
Maximum continuous power	
Low ratio—sea level	.654
Low ratio—critical altitude	.647
High ratio—critical altitude	.630

an optimum location. Maximum lift coefficient with flaps down and power off is about 2.65; for takeoff, CAA approved a 128,000-lb. maximum weight.

This was the overwater DC-7B, and some were sold to Pan American, Panagra, and Eastern Air Lines, which bought a domestic version.

But about here the Douglas officials began to detect sales resistance: They were bucking the strong pitch made by the proponents of the gas turbine engines, and they had to find another answer.

What they wanted was an airplane that would fly the Atlantic nonstop either way 100% of the time with a full payload. Thus, the DC-7C began.

The Seven Seas is the latest of a series of Douglas transports which began with the DC-4 and stretched from there. The DC-4 weighed in around 70,000 lb.; the DC-7C will double that. Engine power will be more than double that of the DC-4.

"There's still some stretch in the series," commented McGowen, "and it's both powerplant and structural stretch. We'll probably put turboprops in some day."

Part of this "stretch" may be in the repowering of the DC-7 with Rolls-Royce RB-109 turboprops. This airplane, designated DC-7D, is now the subject of dickering between Douglas and British Overseas Airways Corp. (AVIATION WEEK Oct. 18, p. 13). With the same basic airframe as the Seven Seas, the Rolls-powered plane would cruise at about 385 to 390 mph. Current figures are about 50 mph. below that.

Another "stretched" version may be the thin-wing model still on drawing boards, using turboprop power (manufacturer unspecified) to cruise at 425 mph. with 110 passengers.

Pratt & Whitney engineering and sales teams, out beating the drums for their VDT version of the Wasp Major, have stimulated enough Douglas interest so that there are drawings for an installation of that engine in the Seven Seas. Douglas engineers aren't going to miss any bets, they say.

And if the acceptance of the DC-7C is any indication, they haven't.

Aircraft Wages Climb

The average annual wage of aircraft workers has increased $953 since the outbreak of the Korean war in mid-1950 and now is $726 more than the average for all manufacturing employes.

Aircraft Industries Assn. reports that in four years the average annual wage has gone from $3,450 to $4,413; the number of employes has increased from 265,400 to 803,000 and the annual payroll of the aircraft industry has climbed from $76.5 million to $295.5 million.

Business Flyers Get Overload Warning

Civil Aeronautics Administration's word to the wise" program is under way to stop overloading of business aircraft.

"We are just putting out a feeler now," says Edward W. Hudlow, chief of CAA's General Safety Division. "But there are several cases we are watching with interest. One of these days when they close the door, we may go up and ask the pilot for his manifest."

Hudlow reports overloading of executive planes has not reached a critical point. "We are hearing rumors of violations and while it isn't dangerous yet, we are starting our warning program," he adds.

► **Newcomer Problem**—Major problem to CAA is the newcomer to business flying. "We have no trouble with the professional pilot for companies flying their own aircraft," the CAA official states.

Hudlow's first "feeler" came in a recent speech before the joint annual meeting of the Indiana Aviation Trades Assn. and the Indiana Airport Officials Assn.

"Let's quit overloading these airplanes beyond the limit that they were designed for," he warned. "I am talking especially about the executive-type aircraft which we believe are overloaded in some instances . . . .

"Special Regulation 407 gave realistic increases to some of the larger transport-type executive aircraft, but I understand that a few of the boys are still exceeding even this higher gross weight. A word to the wise."

CAA's safety chief says owners must take responsibility for overloading. "If it starts to become a real problem, we will put on extra personnel to help in the checking," he adds.

► **NBAA Cooperation**—Hudlow is working closely with the National Business Aircraft Assn. A CAA representative attended NBAA's meeting in Dallas, Tex., last week to spread the "wise" word.

And NBAA's "Air Dispatch" called attention to the campaign: "It has been called to our attention that a number of business aircraft operators—several well known NBAA members included—have been guilty of loading their aircraft considerably in excess of the gross weight maximums approved by the CAA.

". . . In the interests of safety and to prevent the CAA from firmly clamping down on known violators, we feel sure that this . . . notice will be heeded. It is possible, of course, to cover up aircraft overweight for a period of time, but the conscientious business pilot recognizes his responsibilities to his company and passengers—particularly the importance of operating within prescribed safe limits."

Says Hudlow: "We are putting them on notice that we mean business."

Subsonic Soviets

Russian bombers will be limited to subsonic speeds for another three to five years, Sir John Baker, Air Controller for Britain's Ministry of Supply, believes.

England's top aircraft research and procurement official also says it is doubtful that the Soviets now have fighters capable of intercepting the U. S. Boeing B-47 bomber.

Hyland Takes Over Top Spot at Hughes

Lawrence A. Hyland has been appointed vice president and general manager of Hughes Aircraft Co. by Howard Hughes, filling the vacancy created five months ago by the resignation of William C. Jordan (AVIATION WEEK June 28, p. 14.)

Hyland comes from Bendix Aviation Corp., where he was vice president-engineering, to head one of the nation's largest avionics producers. His appointment ends speculation as to who would fill the top spot, twice vacant during the past year. In the interim, the company has been operated by a four-man executive group (AVIATION WEEK July 5, p. 18.)

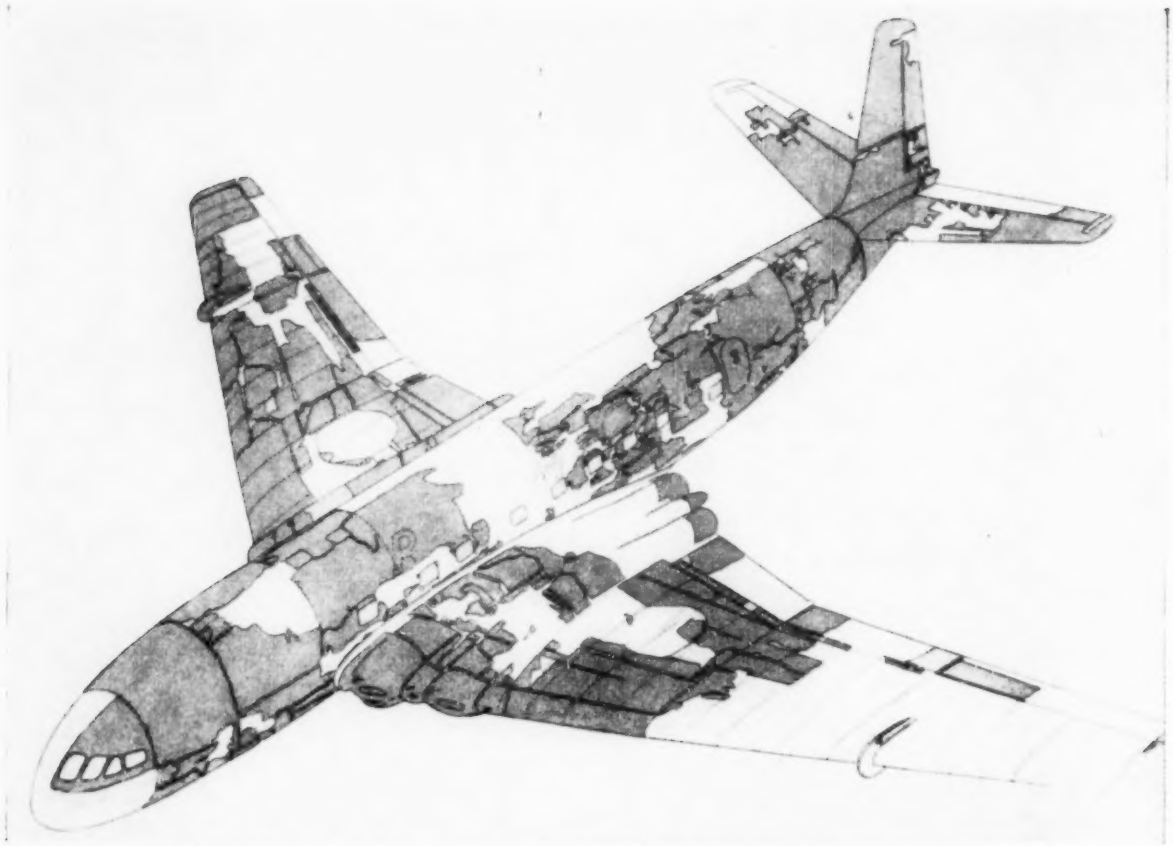
Hyland is a member of the Defense Department's Aeronautics Steering Committee, concerned with guided missiles. He also is on the advisory boards of USAF's Arnold Engineering Development Center and the Argonne National Laboratory for Atomic Energy.

USAF Offers to Sell 60 Leased C-46s

Air Force has decided to give operators of approximately 60 leased C-46s a chance to buy the transports at a base price of $75,000.

Airframe mileage of the planes, at the time of original lease, would be deducted from this price, at a rate of $3 an hour. A downpayment of 20% would be required, with installments spread over an 18-month period.

As an alternative to purchase, USAF will offer operators two-year leases at $1,500 a month, subject to cancelation by the lessee only. Modifications of the C-46s, required by Civil Aeronautics Administration for transport operations, would be up to the operators.



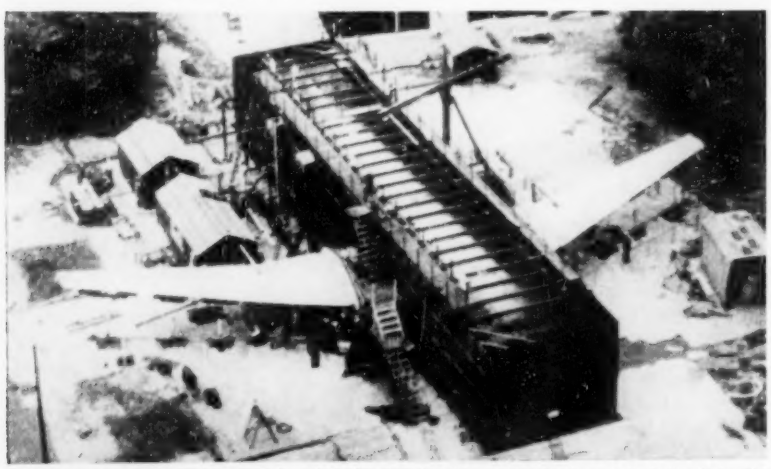
RECOVERED WRECKAGE of Comet 1 (shaded areas) was big factor in determining sequence and pattern of aircraft failure.

Comet Findings May Upset Design Concepts

By Seabrook Hull
(McGraw-Hill World News)

London—Release in detail at a court of inquiry of exactly why and how the British Overseas Airways Corp. de Havilland Comet 1 blew up at Elba (AVIATION WEEK Oct. 25, p. 17) raises a whole new series of questions for British airframe manufacturers.

These questions involve new requirements for testing pressurized commercial airliners before certification, more elaborate post-certification checks, undoubtedly new and more rigid structural standards, and the thorough examination of certain manufacturing techniques.



SUBMERGED COMET was tested under simulated cabin pressurization and air loads in this 250,000-gal. water tank. External jacks applied flight loads to wings.

► **New Fatigue Problems**—All are questions that must be answered not only in Britain, but probably in the U.S. as well. For the combination of the heavy stresses imposed by pressurization with wing loads translated through the fuselage to fatigue-prone points brings to light many new problems in connection with fatigue.

It is obvious now that these problems were intensified greatly by the Comet's square windows. But, except by actual test to destruction, there is no way of telling whether standard aeronautical engineering practice in the case of round or oval windows will provide a sufficient margin of safety for other commercial aircraft.

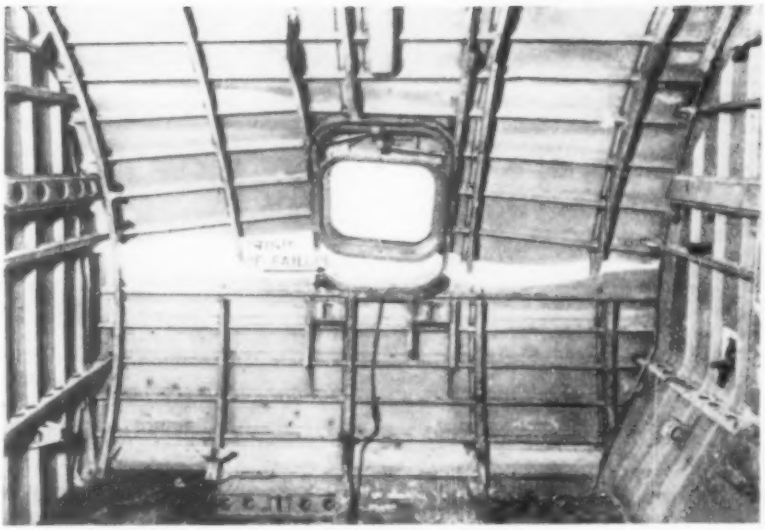
It is not the ultimate strength of a structure relative to the maximum possible load to which it may be subjected that is in question. It is primarily the matter of fatigue—how to lengthen

fatigue life and if possible, how to spot the oncoming of fatigue before it is too late.

► **Pressure Tests for All**—Though Britain's Air Registration Board hasn't yet put into operation a detailed program for coping with these problems, it seems likely that the Britannia, Viscount, Fokker Friendship, Handley Page Herald and any other pressurized commercial airliner that wants British certification will have to undergo the same water tests the Comet has undergone at Farnborough.

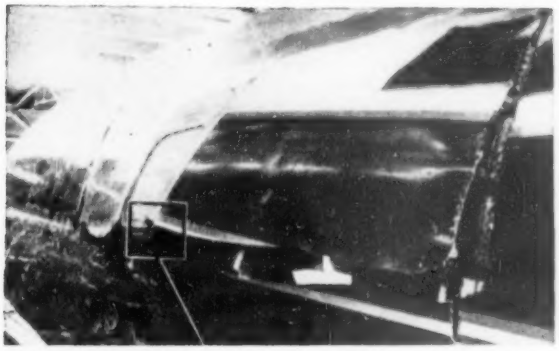
The Royal Aircraft Establishment already has told the British aircraft industry that the special rig built for testing the Comet will be made available. As a matter of fact, the only point that seems to remain in dispute is who is going to pay for the tests which, among other things, involve the testing to destruction of a production model of the airliner to be certificated.

With reference to the Viscount, there

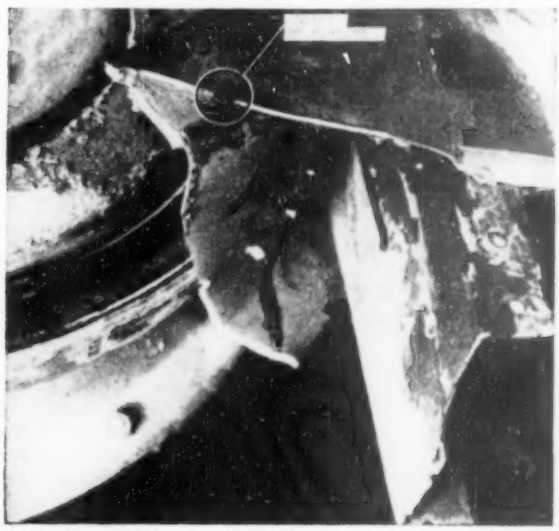


FUSELAGE FAILURE of submerged Comet (G-ALYU) occurred at corner of forward escape hatch on port side, spread through skin to fuselage frames.

General View Looking Forward

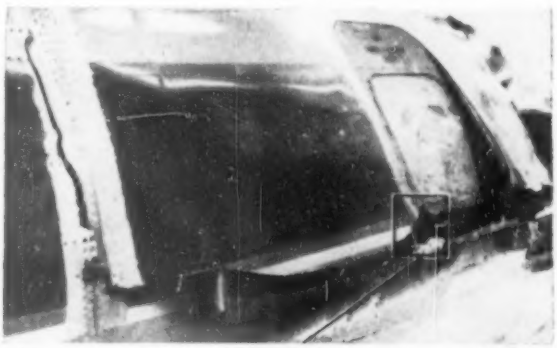


ESCAPE HATCH failure is shown in this external view of port side of test Comet. Note skin rip at fuselage frame (right).

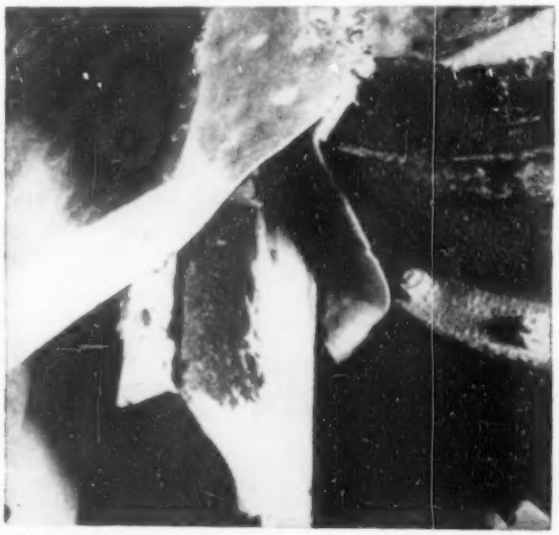


CORNER DETAIL of initial failure at forward escape hatch isolates single countersunk rivet as source of failure.

General View Looking Aft



SKIN TEARING resulting from failure around escape hatch of submerged Comet veered from heavy rivet pattern at frame.



FAILURE CLOSEUP of forward corner of hatch framing shows skin tearing and fuselage ring sheared from explosive blowout.

seems no likelihood of grounding it while such tests are being carried out.

► **Exact Cause**—Out of RAE director Sir Arnold Hall's testimony comes the exact cause of the Elba crash and probably the precise point of the initial failure: it was a high stress of fatigue failure which seems to have started on the edge of a beveled rivet hole under the reinforcement plate in the rear starboard corner of the rear ADF window (which houses the ADF antenna). The skin metal at this point is 22 gauge (0.028 in. thick). The reinforcing plate is of the same gauge.

With reference to the Comet 1's cabin, Sir Arnold describes it as having a low fatigue life. He notes that the test Comet fuselage failed after a total of 9,000 hr. (actual flight time plus simulated flight time), or had 3.4 times the fatigue life of the Naples Comet and 2.4 times that of Elba Comet.

He says this is all within the expected "scatter" range when talking about fatigue life, which should run from one-third the average to three times the average—or a 9-1 ratio.

► **No Guarantee**—It also is pointed out that even though Farnborough's efforts to simulate actual flight by supplying both lift and gust wing loads along with pressurization loads were quite realistic, they did not take into account vibration from the engines, contraction and expansion of the skin due to temperature changes, applied air and landing loads and the small variations in the cabin pressure.

All these things would tend to reduce fatigue life. Even based solely on the Farnborough tests, Sir Arnold says he would not have been able to guarantee the Comet's safe fatigue life up to the 2,704 hr. logged by the Naples Comet. He uses the above 9-to-1 ratio to show why. On this reasoning the Comet would not be safe beyond 1,000 hr.

Sir Arnold figures the Elba and Naples Comets were on the low side of the scatter in expected fatigue life—the weakest links—and thus went first.

► **Crossroads**—It would seem fairly obvious that the three or four remaining intact Comet 1s will never return to commercial service again. This series is threatened not only by the pressure cabin, strengthening of which would take a great deal of the aircraft's marginal payload away and cost a fair bit, but by the other faults RAE found that will have been hashed over repeatedly during testimony and cross-examination. Even the Comet 2 will need considerable modification in order to bring its hull up to safe standards. It essentially is a Comet 1 hull built the same way to the same standards. The Comet 3, except for the round windows, appears to be basically a lengthened Comet 2 or 1.

► **Manufacturing Crack**—Considerable time has been spent in the court discussing what so far have only been referred to as manufacturing methods. However, it seems virtually certain this concerns countersinking for flush-riveting.

For not only did Sir Arnold trace the initial Elba failure to such an interface, but on inspecting the wreckage of the Elba Comet it was found that under the reinforcing plate at the starboard front corner of the rear ADF window a crack had occurred during manufacture and, in accordance with standard engineering practice, had been drilled.

This apparently contributed nothing to the Elba crash. However, similar manufacturing cracks have been found in the test Comet, and in at least one instance fatigue continued the crack beyond the drill hole. Sir Arnold noted that even though these cracks did not cause a failure they were indictative of a crack-prone manufacturing process that thus also could produce incipient cracks—which inspection would not reveal, but which accelerate a fatigue failure. For example, there is no way of knowing for sure if this might not have been the case in the initial failure of the Elba Comet.

To prepare a rivet hole for countersinking, de Havilland drills it out, actually cuts away the metal to make the bevel—this method in comparison to "spin-dimpling" used by some other manufacturers where the bevel is pressed into shape by a spinning form but where no metal is cut away.

► **Other Troubles**—Other troubles found with Comet include:

• Possibility of damage to the wing under severe fueling conditions, 180-to-200 gal. a minute and the blowoff valve inoperative. In this case overfueling tests ripped ribs loose and could cut the wing strength by as much as a fifth. This valve is liable to ice seizure, and pulling the valve release cable does not necessarily break it loose.

• Using radioactive tracers, RAE testers found that fuel from the tank venting system got inside the wing along the flap to within 2 or 3 in. of the jet pipe shrouds—which reached temperatures of 350C. This compares to a minimum ignition temperature for kerosene under certain conditions of 250C. In this area there are no fire warning or fire fighting devices.

• The wing has a relatively low resistance to fatigue. At a number of stages during the RAE water tank tests, serious cracks appeared, starting at the beveled screw and rivet holes near the wheel wells and finally resulting in rivet head shearing in the top wing surface.

Tests made in this tank on the fuselage and wings included 102,400 test gust load cycles, or 4,100 simulated flights, added to estimated 30,000 service cycles in 1,670 actual flights.

► **Clean Bill for Jets**—None of these last three things apparently contributed to either crashes. Bodies picked up after Naples had much the same injuries as did those from Elba, indicating pressure cabin failure of much the same nature.

The Comet's tail stood up quite well under tests and seems to have been one of the more trouble-free components, though on ultimate strength tests, there seems to be some doubt as to whether the vertical stabilizer meets minimum ARB requirements.

Ghost engine evidence given by E. S. Moult, de Havilland Engine Co. chief engineer, and concurred in by Farnsborough, shows the turbojet broke up as the result of mishaps and had nothing to do with the crash. There were two periods of failure. First came from sudden violent gyroscopic moment as the aircraft nosed over during cabin failure which broke the No. 2 engine shaft with the loss of the turbine wheel at the radius of the fillet between the hub shaft and flange (where the wheel is attached).

Severe static damage resulted to all engines upon impact with the sea when numerous cracks were caused at the circumference of the undercut, located in the same area.

► **No Engine Fire**—DH laboratory tests showed that angular velocity needed to cause gyroscopic breakup of the shaft was three radians, or about 160 deg. per second. When the No. 2 engine turbine wheel went in the Elba crash, it went clean—no spewing of blades but the whole wheel intact—cutting a neat hole in the turbine wheel shrouds on its way out.

Chips in stator blades in this engine resulted from departure of the wheel. Engines actually did not catch fire at any time though they were in the presence of severe fire.

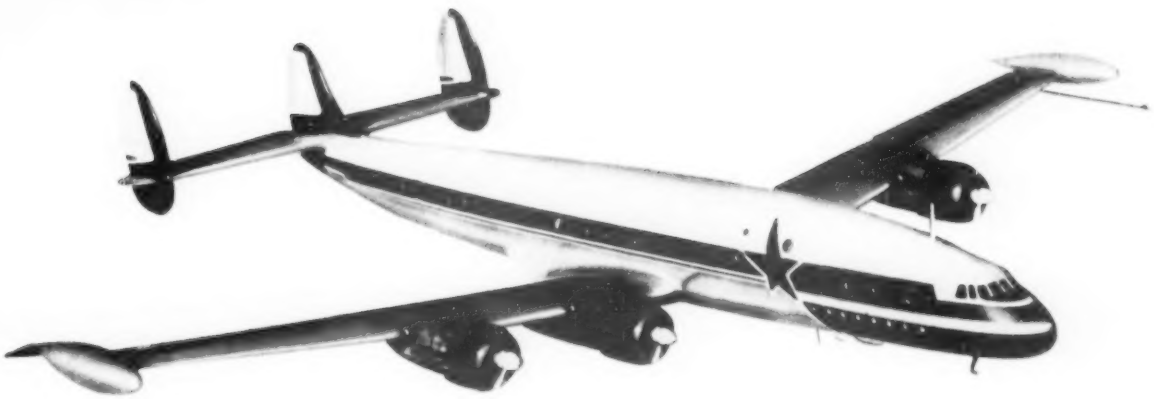
Other points of interest:

• The inquiry may get slightly confused by possible evidence from Polish aircraft designer Bruno Jablonski of Jablo Propellers, Ltd., Croydon, who says Sir Arnold Hall is on the wrong track. Jablonski indicates he knows what is wrong with the Comets. He hasn't appeared yet, but has sent a letter to Commissioner Lord Cohen and may be called.

Jablonski, who studied aviation under Orville Wright, supplied DH with metal components for jigs and tools used on the Comet line. He has examined wreckage parts and is sure RAE crash reasons are only secondary, that no one has made a substantial statement as to the basic causes of the crash. There was no hint of his theory.

• It begins to look like ARB may come off worst in this hearing, if anyone does. Questioning appears headed in that direction, but some real fireworks are expected during cross-examination.

PERFORMANCE*

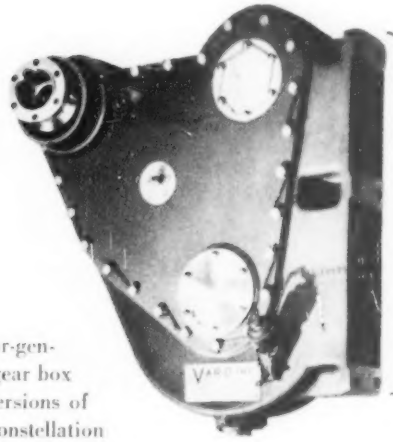


THE new LOCKHEED 1049G

Super Constellation

*Equipped with wingtip fuel tanks this new Super Constellation transport is capable of 850 miles greater range . . . extending the normal flying range to more than 4600 miles.

RELIABILITY



The alternator-generator drive gear box in military versions of the Super Constellation is a Vard designed and built component.
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Final adjustments being performed on alternator-generator drive installation in engine nacelle.

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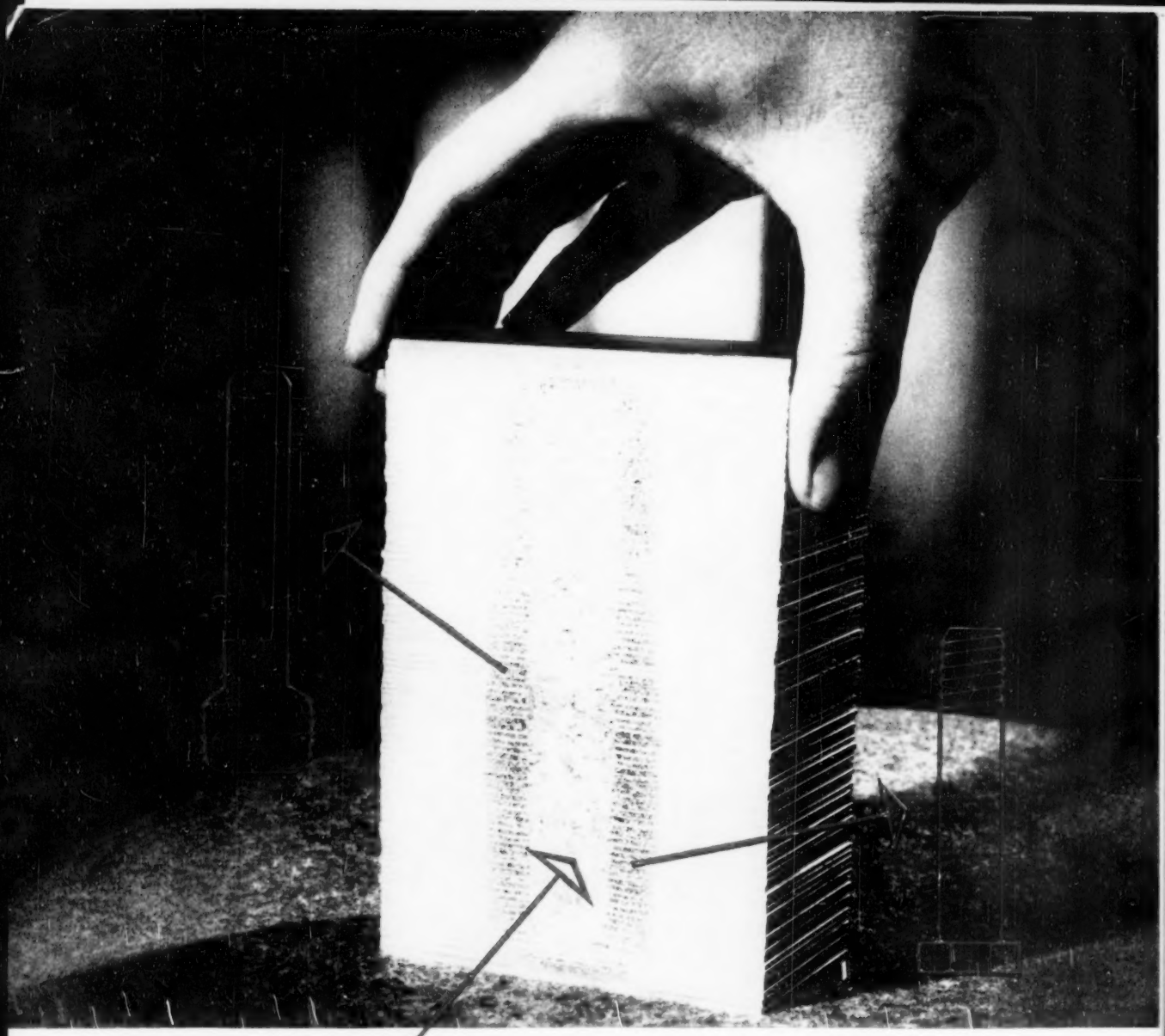

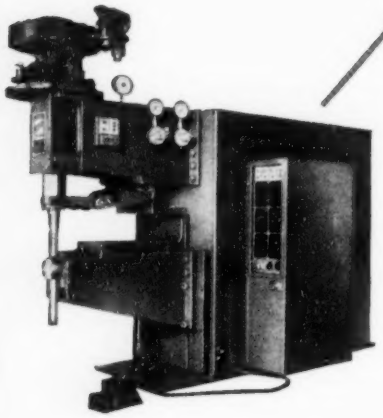

Martin Aircraft Forms Solid Ingots of Scrap Sheet Titanium with Sciaky Spotwelder

The Manufacturing Research and Development Unit of the Glenn L. Martin Company has developed a technique to utilize virtually all their scrap sheet titanium. A six inch pile of 85 laminations of .064 titanium with two laminations at each end of .091 titanium is joined with one weld on a Sciaky type PMCO 6ST 400 KVA Three-Phase Spot Welder.

The weld nugget forms a solid ingot of virgin metal at least as strong as the parent metal. This ingot can be machined into a variety of titanium parts. An expensive waste is almost entirely eliminated, and the months of lead time required for delivery of titanium for machining is avoided.

Martin Research offers another fine example of Sciaky basic thinking in design with resistance welding equipment to do *more useful work* at the *lowest operating cost* with *maximum reliability.*

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AJ-1 TANKER-BOMBER refuels F7U-3s during inflight tests of the Navy's new concept of quickly convertible carrier-based tankers.

Navy Develops New Air Tanker Concept

Navy is seeking additional help from aircraft equipment manufacturers for the development of a new concept of aerial refueling. Object of the new plan is to make every type of carrier-based aircraft, including fighters, quickly convertible for aerial tanker operations.

The new Navy refueling program still is in its early development phase and requires much wider participation by aircraft equipment manufacturers working with airframe producers on problems such as new types of hose material, faster fuel transfer devices, new types of valves, engaging and disengaging devices and new fuel pump and fuel measuring devices.

Navy is not satisfield with any of the aerial refueling equipment now in service to meet its ultimate needs.

► **Criteria**—Navy believes it will have to have several types of aerial refueling systems adaptable to different types of aircraft, but its universal standard will be quick convertibility aboard operational carriers, fast and precise fuel transfer and a high degree of operational reliability.

At this stage of development it seems fairly obvious that some form of external stores package will have to be developed to give carrier-based fighters, light attack planes, such as Douglas A4D, an aerial tanker capability.

Navy spokesmen emphasize that the key to the new concept is operational flexibility aboard carriers at sea. Navy's thinking represents a sharp divergence from the USAF philosophy of specialized jet tanker squadrons in which it is now investing billions of dollars.

► **Successive Strikes**—Navy says it cannot afford the luxury of specialized tankers within the limited aircraft compliment of an aircraft carrier.

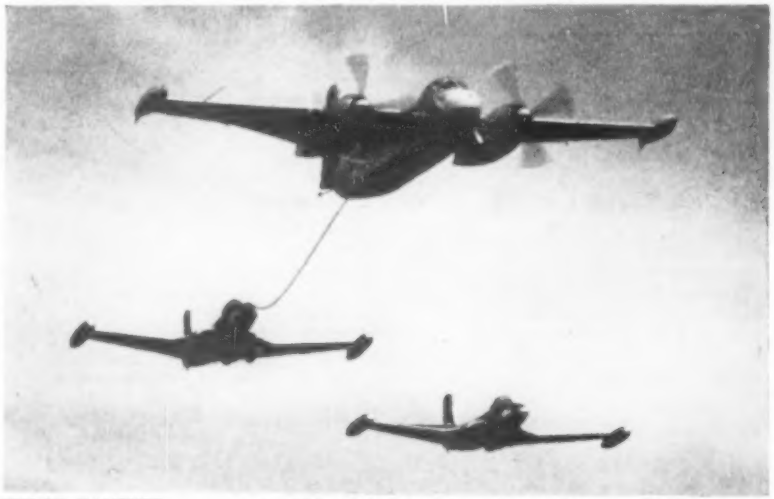
Carrier task force commanders must have the operation capability of launching an air strike at the maximum range that aerial refueling affords on one day and another strike, hurling all aircraft over their normal shorter range, the next day.

There is a school of thought in USAF that subscribes to the quickly convertible tanker theory. This group urged convertible tanker-bomber versions of the B-47 and B-52. However, top-level USAF policy-makers rejected this plan in favor of a multi-billion-dollar investment in specialized tankers.

► **AJ-1 Tests**—Navy currently is developing its interim aerial tanker capability, using North American AJ-1 carrier-based bombers as convertible tankers. North American Aviation supplies a tanker conversion kit that fits into AJ-1 bomb-bay and can be jettisoned quickly like a bomb in emergencies.

The AJ-1 kit uses the probe and drogue method developed by Flight Refueling, Inc., of Baltimore, and this firm is subcontracting to NAA on hose and drum units.

Navy has tested all of its current crop of fighters on the AJ-1 tanker, including the Grumman F9F-6. Chance



F2H-2B BANSHEE noses up to AJ-1 equipped with probe-and-drogue refueling system.

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Stainless steel tail pipes and shrouds fabricated for the Republic F-84F and Martin B-57.

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Fully integrated plant of one of the nation's leading subcontractors to the aircraft industry seeks production runs of stainless steel fabrications. Designed and built the first stainless steel military airplane, the BT-12. Broad experience in special alloys, complete prototype and development shop, extensive fabrication facilities permit intricate, close tolerance work.

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FLEETWINGS DIVISION
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IN THE HEART OF THE DELAWARE VALLEY

Vought F7U-3 and McDonnell F2H.

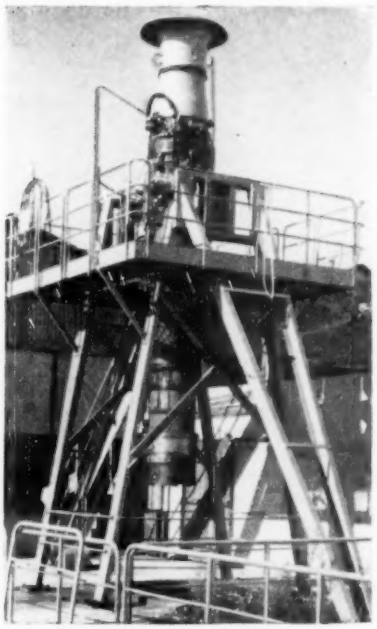
During the recent record transcontinental speed dash of three Grumman F9F-6s, they were refueled over Southern Kansas by an AJ-1 tanker.

Navy plans to develop a substantial refueling capability for all of its new large carrier-based bombers, including the Douglas A3D Skywarrior. This type of tanker would be capable of refueling several fighters simultaneously.

All of the Navy's airframe contractors now are engaged in the attack on the refueling problems posed by the Navy's new concept. Among the equipment manufacturers already working with the Navy and airframe manufacturers on this problem are Parker Appliance Co., Fletcher Aviation Corp., Bendix Aviation Corp., the Schultz Tool & Engineering Co. and Flight Refueling.

▶ **Rescue Mission**—Although Navy is interested primarily in aerial refueling as an extension of its carrier-based striking force, it has other applications such as the rescue of aircraft running low on fuel and longrange ferrying operations.

With the advent of commercial jet transports, Navy speculates that the aerial tanker probably will become part of the Coast Guard rescue equipment to refuel airliners delayed by weather or traffic congestion in airport terminal areas.



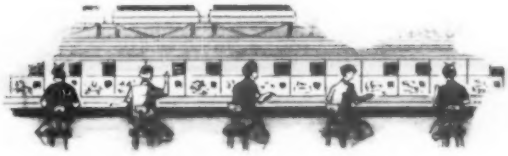
French VTO

Snecma, nationalized French engine firm, is using this test stand for preliminary research on adaptation of its Atar gas turbine to vertical-takeoff units. Air Minister Diomede Catroux says the French have been working on VTO "for some time."

Research

Development

Design



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Aussies Beef Up Airlines, RAAF

British turboprops compete with U. S. piston transports on wide-open market: defense policy shifts to airpower.

Melbourne—Aviation in air-minded Australia has entered a period of great change, with a guarantee of sizable expansion of aircraft and equipment purchasing by the military and by commercial airlines.

Obsolescence of old U. S. equipment, mainly DC-3s and DC-4s that monopolized Australian air lines until just last year, has thrown the civilian airplane market wide open to competition.

▶**Policy Melting Pot**—Recent airline purchase commitments do include a preponderance of American equipment —Super Constellations for Qantas Empire Airways and DC-6s and DC-6Bs for Australian National Airlines.

But future equipment policy is in the melting pot, with some airlines favoring the immediate introduction of British turboprops.

Upcoming, also, is a rapid expansion of airline activities as economic development of Australia, a nation of 9-million population inhabiting the fringes of a continent nearly the size of the United States, picks up speed.

▶**Strategic Position**—On the strategic side, Australia again is assuming a position of importance to the free world.

Not only can it provide physical force, measured in squadrons of fighters, bombers and transports, but its geographic position makes it an invaluable operational base in the South Pacific. It is both near the trouble spots of Southeast Asia and remote from the Communist air bases concentrated in East and Northeast Asia.

It would not be outflanked by the defection of Indonesia into the Communist camp, a constant threat to Malaya and Thailand.

▶**Major Airpower Step**—In keeping with its role, Australia is switching the emphasis of its defense policy to air force development. Re-equipment plans for the Royal Australian Air Force (RAAF), provide for Australia's first strategic medium bomber element.

This is the first and major step of the airpower buildup and, given atomic armament, it will make the RAAF an important segment of western power in the Seato (South East Asia Treaty Organization) region.

RAAF funds for 1954-55 will be about $130 million, an 18% increase over expenditures of the previous year. Spending will be increased sharply during the next five years. Compared with expenditures of the major power, the total will be small. But for a country of Australia's size, it represents an adventurous step forward in provision for national security.

Moreover, the new Australian defense policy represents much more than the actual force contained in the RAAF. The inclusion of a small force of strategic bombers will develop Australia in basic technical "know how," in airfields to handle heavy bombers, in electronic aids—including early warning radar stations, and in maintenance facilities.

All this is a primary requirement for a country that may be required to act, in the future as in the past, as the major South Pacific operational base.

▶**Defense Shopping**—The RAAF is inclined at the moment to adopt one of Britain's V-bombers, particularly the delta-winged Avro Vulcan, for the medium bomber units. But a technical mission now overseas will include the U. S. in its tour of inspection.

Policy-wise, the commonwealth government and the defense services favor standardization on American weapons, but the final result is unlikely to be clear cut. Recent defense "shopping" has shown that America is not prepared to let even so close an ally as Australia have products of high security rating—and Australia wants the best she can get.

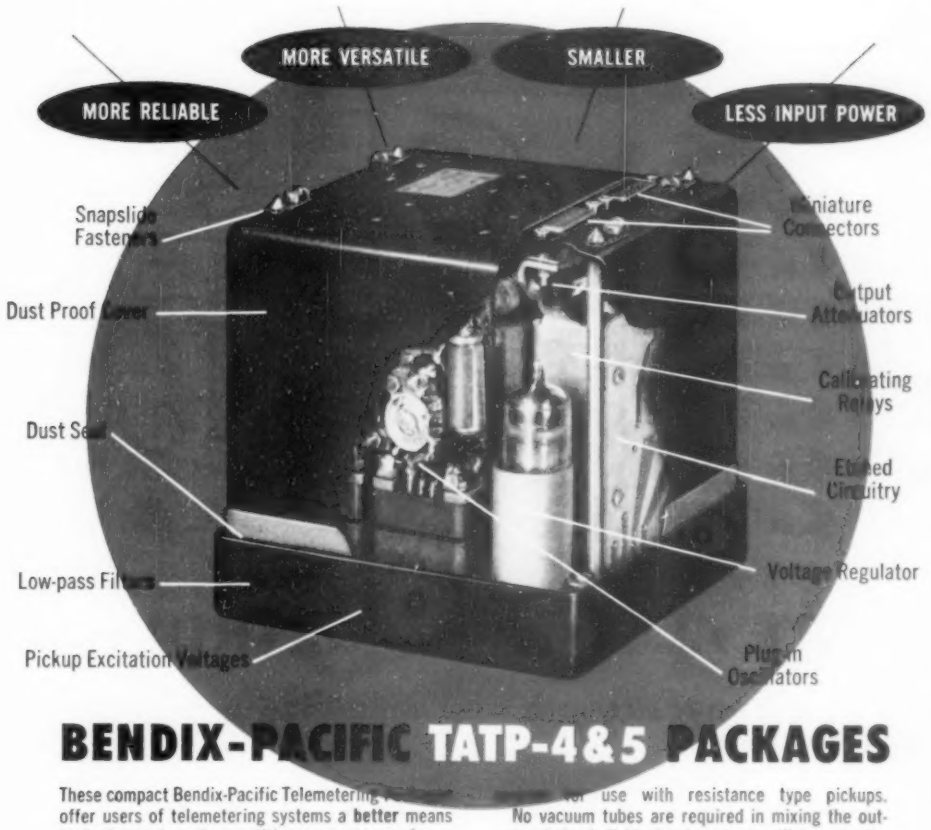
▶**Domestic Production** — Australia wishes to build a good deal of the re-equipment in her own small aircraft industry. Today, that industry produces Canberra jet bombers, Vampire jet trainers, the Winjeel basic trainer and the Rolls-Royce Avon-powered Sabre.

The government aircraft factories are producing in quantity the Australian-designed Jindivik pilotless jet target aircraft, proved so successful in tests

Navy P2V-7 Gets Jet Power

Lockheed Aircraft Corp.'s latest P2V-7 displays four powerplants in this first flight photo, twin 3,700-hp. Wright Turbo Compound piston engines and two 3,400-lb.-thrust Westinghouse J34 turbojets slung in pods under the wings. Jets are expected to increase the Navy anti-submarine plane's normal 300-mph. top speed by 58 mph. over the target or on takeoffs. In addition to fitting P2V-7s now coming off the line with J34s, Lockheed will equip all P2V-5s and -6s with jets under a $9-million contract.

A NEW TELEMETER STANDARD



BENDIX-PACIFIC TATP-4&5 PACKAGES

These compact Bendix-Pacific Telemetering [illegible] offer users of telemetering systems a **better** means to instrument such quantities as pressure, force, temperature, voltage, acceleration and vibration.

The units are smaller and various combinations may be used to provide compact multi-channel systems of up to 18 subcarrier bands. Each unit operates on **unregulated** +150 VDC and 28 VDC since it contains its own voltage regulating circuits. Each unit may be provided with individual relays for switching oscillator inputs from signal to calibrate position. Model TATP-4 contains four and Model TATP-5 contains six separate and independent regulated +5 VDC excitation voltage [illegible] for use with resistance type pickups.

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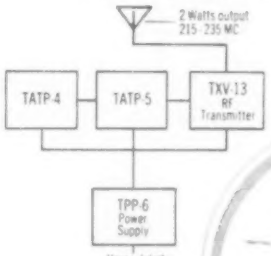
Standard Bendix Model TPP-6 Power Supplies are available to handle from one to three of these telemeter packages plus a 2 watt crystal controlled RF transmitter. Many types of interchangeable subcarrier oscillators are also available. RF amplifiers are available for increased power outputs up to 100 watts.

CHARACTERISTICS

	TATP-4	TATP-5
No. of bands	4	6
Subcarrier bands	1.7 kc. to 70 kc.	1.7 kc. to 70.0 kc.
Oscillator Types	TOE-30V, TOE-31V, TOR-8V, TOR-9V, TOL-9V	Same as TATP-4
Input Voltages	6, 12, or 24 VDC ±10% 150 VDC $\pm\frac{10}{5}$%	6, 12, or 24 VDC ±10% 150 VDC $\pm\frac{10}{5}$%
Weight (Less Oscillators)	Approx. 2 lbs.	Approx. 3 lbs.
Dimensions	5.0" x 5.0" x 4.5"	5.0" x 7.5" x 4.5"

TYPICAL 10 BAND SYSTEM



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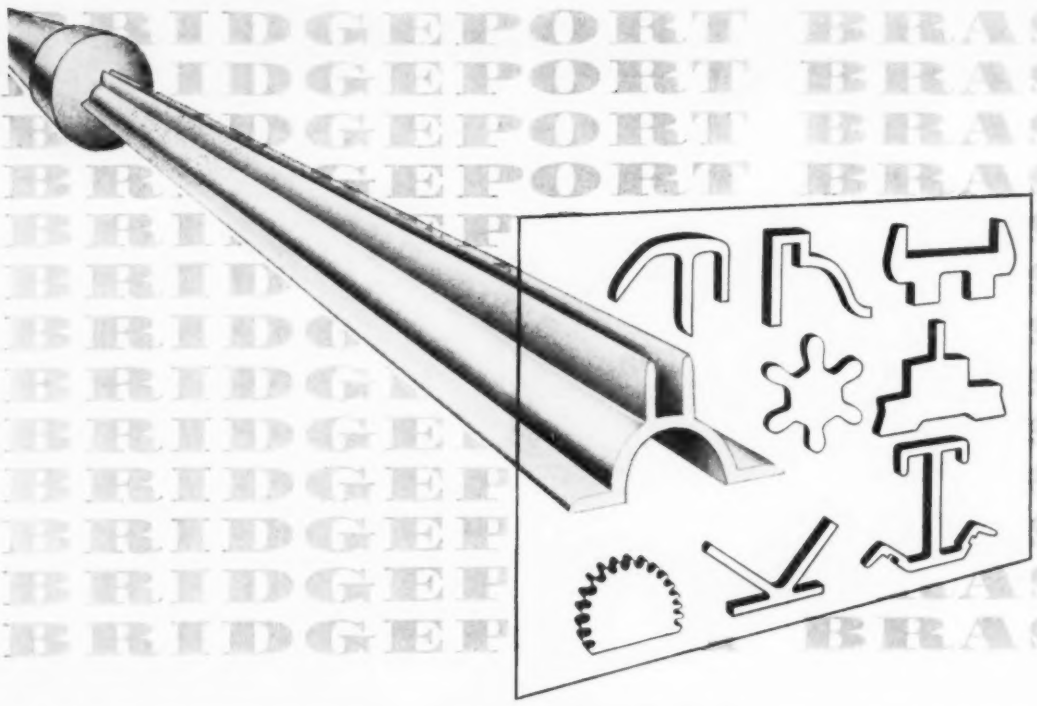

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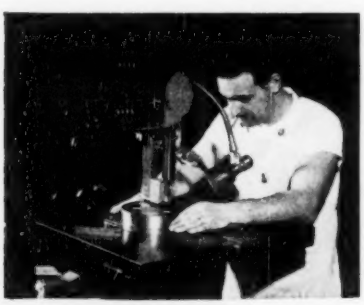

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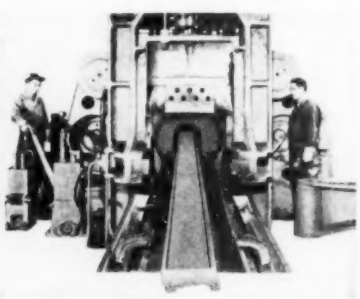

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at the Woomera rocket range that at least one American company is seeking a license to produce it in the U. S.

Avon-Sabre

The Avon-Sabre is the design achievement of the privately owned Commonwealth Aircraft Corp., wedding a Rolls-Royce R.A.7 engine (7,500 lb. static thrust) to an F-86F airframe and arming it with the new British Aden 30-mm. cannon.

No official performance details have been announced, but it can be said that this fighter combines a combat radius of more than 575 mi. with a rate of climb from the ground and fighting quality above 50,000 ft. that has amazed those who have seen it in tests and public demonstrations. It has a top speed reputed to be 700-plus mph.

The RAAF will have its first dozen Avon-Sabres by this Chrsitmas, and the initial order for 90 (at a restricted rate of production imposed by the present government policy of maintaining only a nucleus industry) is expected to be completed in 1956.

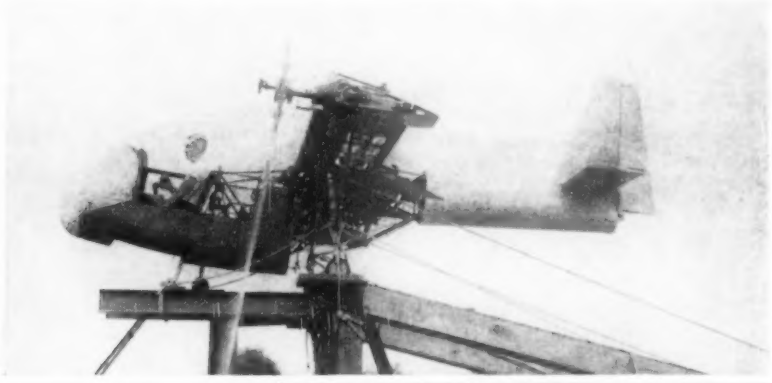
▶ **Redesigned F-86F**—In the evolution of the Avon-Sabre only about 40% of the original fuselage structure has been retained. Of about 20,000 pieces in the aircraft, 7,000 are imported from North American Aviation.

The R.A.7 consumes 25% more air than the J47 so the size of the intake duct was increased by splitting the front fuselage horizontally and inserting a wedge of structure. As the Avon does not support the tail pipe cantilever fashion, the rear fuselage also had to be redesigned.

Other modifications were needed to incorporate the two Aden 30-mm. guns in place of the six .50-cal. machine guns in the F-86. All this was achieved without making any changes in the standard arrangement of instruments, so that any F-86 pilot can convert direct to the Avon-Sabre and find himself in a completely familiar cockpit.

▶ **Lead Nose**—Initial CG troubles required adjustment by loading the nose with 80 lb. of lead. This was eliminated in the production aircraft by moving forward a pump supplying emergency power to the controls.

Early production aircraft are equipped with slotted wings, but next year the solid wing will be introduced. The North American pattern is being modi



Transcendental Tests New Convertiplane

Transcendental Aircraft Corp.'s new 1-G convertiplane goes through forward flight turnup trials on a test stand (top photo), then swings its 17-ft.-diameter rotors 90 deg. for vertical lift (bottom). The convertiplane's twin rotors are mounted on the tips of a 22-ft.-span, all-metal wing. They are turned by a 160-hp. Lycoming O-290 engine. During a recent vertical flight at the company's New Castle, Del., plant, it grossed 1,640 lb.

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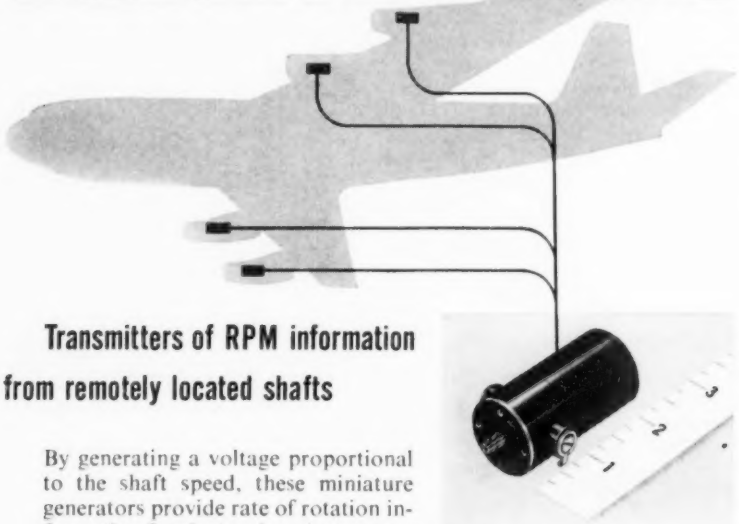

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fied internally by the incorporation of a leading-edge tank to extend the combat range.

The Avon-Sabre will have a flexible role. At the start a high-altitude, long-range fighter, it can be converted later to carry 1,000-lb. bombs, rockets and possibly even guided missiles for ground attack misisons.

▶ **CAC-NAA Link**—The close CAC-North American link dates back 16 years. The most likely follow-up to the Avon-Sabre is a further marriage of an F-100 development with the most advanced Rolls-Royce Avon available at the date manufacture begins.

A section of opinion would prefer a lighter and less costly fighter than the F-100, and some advocate adoption of a modified Lockheed F-104—reported to be available under license—or some other similar type.

Rolls-Royce is a partner in CAC and the Australian factory already has built in succession the Nene centrifugal and the Avon axial turbojet powerplants. The engine pattern of the future is, therefore obvious.

▶ **Payment Plus**—Details of the license agreement with North American never have been disclosed. Actually this license is held by the commonwealth government, not CAC. It is on an initial payment plus a royalty basis.

The cost of fuselage and other components imported from NAA has not been disclosed either. The return to North American, however, is not less than $150,000 per aircraft, and it has been suggested that the overall program in Australia would be worth about $16 million to the American company.

Bomber Production

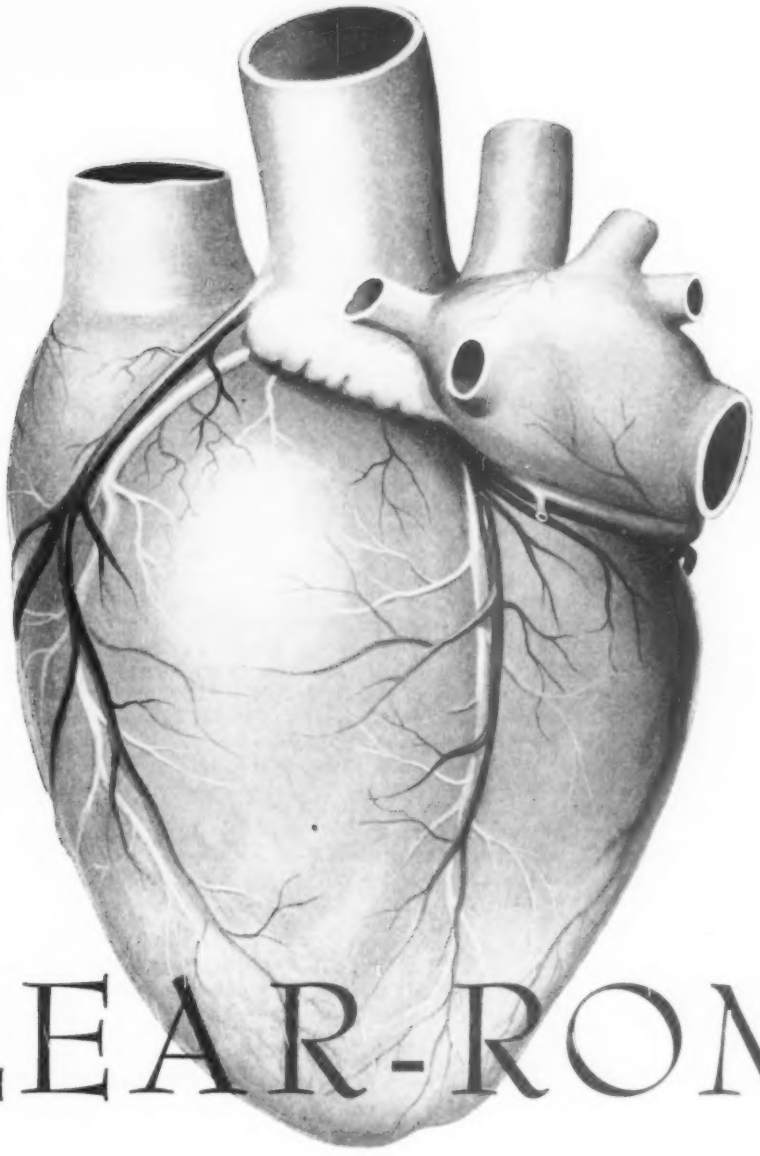
The possibility that a medium bomber will be built by the government aircraft factories in succession to the Canberra seems remote.

▶ **Secondary Line**—But the argument is likely to be advanced to the United Kingdom government that the at present highly centralized and atomically vulnerable position of the UK industry offers grounds for a decentralization program logically supporting the setting up in Australia of a secondary bomber production line.

Handley Page, Ltd., which recently sent a high-powered sales mission to Australia, is said to be willing to allow the crescent-winged Victor to be built by GAF.

▶ **Offshore Orders**—It is being urged, too, that America should consider the advisability of placing offshore orders here as a vital contribution to the potential strength of its most dependable SEATO partner.

The U.S. should be in agreement with this suggestion, for Australia's aircraft industry provided not only an im-



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Small Firms Get Big Slice of B-52 Dollar

Wichita—Changeover from production of the B-47 Stratojet to the B-52 Stratofortress, now under way at Boeing Airplane Co.'s plant here, will not change the percentage of bomber dolars going to subcontractors and small business, reports J. E. Schaefer, vice president and general manager.

▶ **Dollar Split**—Breakdown of allocated funds for the B-47, disclosed at rollout ceremonies for the 1,000th unit built at Wichita (AVIATION WEEK Oct. 18, p. 16), reveals the extent of subcontracting operations.

Boeing says that out of every Air Force dollar spent for the bomber, 60 cents is paid directly to the company and 40 cents is diverted to manufacturers of government-furnished equipment.

Further, of the 60 cents given to Boeing, 36 cents goes to subcontractors and vendors. The company keeps 24 cents for its own operations.

▶ **1,868 Suppliers**—There are 1,868 subcontractors and suppliers in the B-47 project. Schaefer says this number will not change appreciably when the plant shifts to B-52 production. Tooling for the changeover was started recently when Wichita was chosen for second-source production.

Schaefer says nearly 75% of the subcontractors and suppliers for the B-47 are small business firms (those with less than 500 employes), numbering 1,326 plants out of the 1,868 total. These firms are scattered over 34 states.

It is estimated that 79% of the companies shipping parts and materials to the 1,868 Boeing suppliers are small business concerns.

Included in the program are firms manufacturing such normal items as bolts, screws, tools, valves, electrical appliances, wire, plastics, auto parts, tents and other peacetime products.

Schaefer reports suppliers for the B-52 program have been selected and parts already have started to arrive at the Wichita plant.—CW

Germany May Build Lightplanes, Copters

(*McGraw-Hill World News*)

Bonn—West Germany's aviation industry probably will be unable to build large transport and military aircraft for at least four years, well-informed sources here forecast.

Neither capital nor trained staffs of the magnitude required for these types are presently available.

With Allied restrictions on civil aviation to be lifted partially under the new Paris pact, West Germany's reviving aviation industry (AVIATION WEEK Oct. 11, p. 15) can be expected to concentrate on these three categories:

• **Light passenger plane,** somewhat along the lines of the old ME 108 "Messerschmidt Taifun" or the twin-engine Siebel 204.

• **Light trainer** and sport plane, similar to the earlier Klemm, Buecker or Siebel types.

• **German helicopter** designed for shortrange operations in city-to-city traffic and for use by West Germany's expanding industry.

Experts here have estimated domestic German demand for medium and small aircraft at 3,000 to 5,000 planes for the next few years. This estimate is based on the assumption that German engineers and builders will be able to produce a single-engine, two-passenger plane at a cost of from $2,381 to $3,571.

The trump card of Germany's reborn aviation industry will, no doubt, be a new helicopter. Although latecomers to the field, the Germans are confident they can produce a "new look" helicopter that will be able to compete seriously with existing U.S. models.

Japan Aviation to Ask $40 Million U.S. Aid

(*McGraw-Hill World News*)

Tokyo—Prime Minister Yoshida on his state visit to Washington will ask the United States to contribute $40 million to revitalize Japan's aircraft industry.

Japan would appropriate $5 million as its contribution to the three-year program.

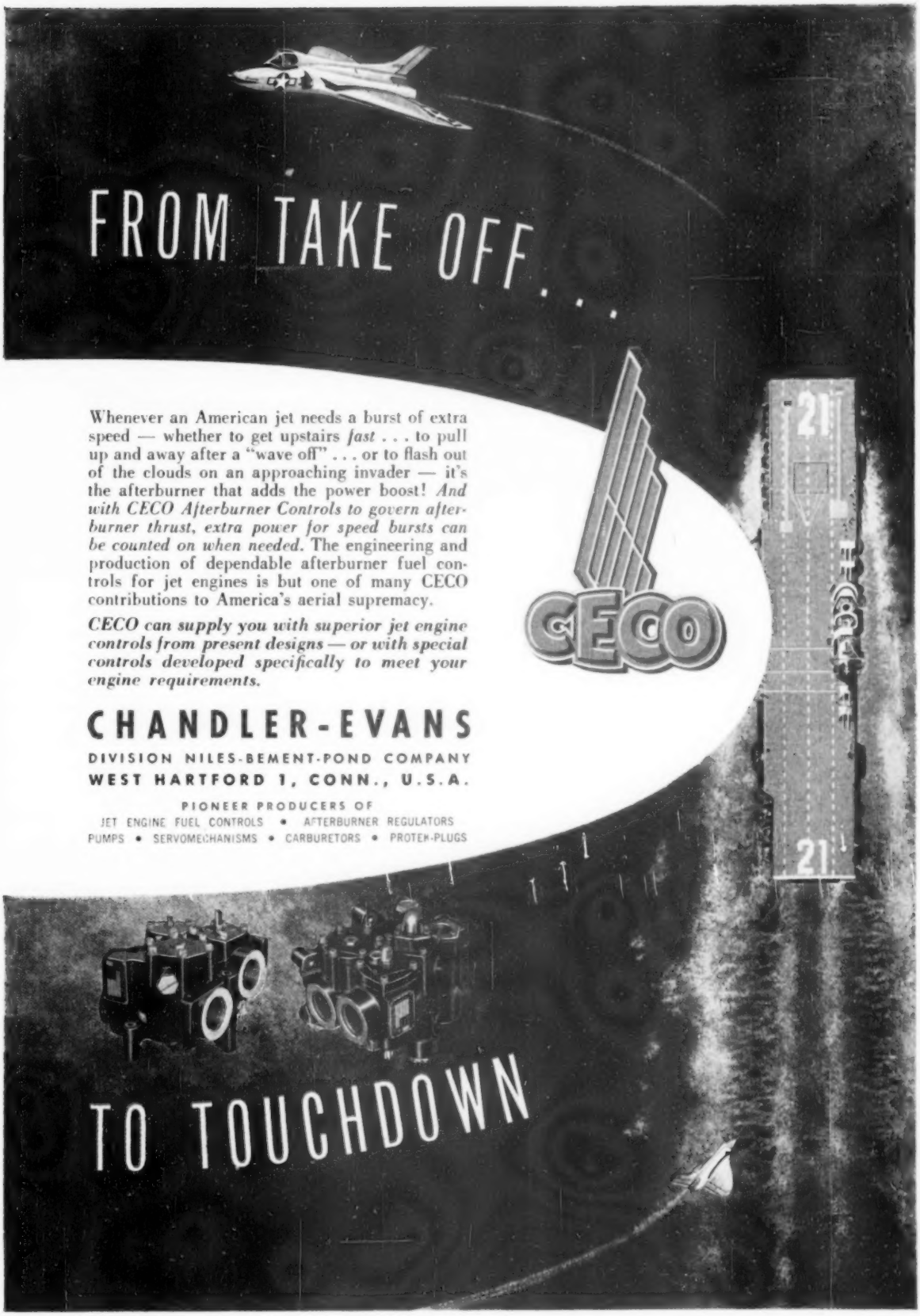
Japanese government sources told AVIATION WEEK the plan envisages production in 1958 of 150 F-86Fs, 50 F-86Ds, 60 T-33s, 60 T-28Bs, 60 T-34s, 40 C-46s, 30 P2Vs, 40 H-19s and 60 H-13s.

The basis for this program is the scheduled buildup of the Japanese air defense force, (JADF) to 1,200 planes in that year.

▶ **'Too Ambitious'**—U. S. Air Force officials have informed the Japanese government that the production plane is too ambitious.

These officials also point out that it is unlikely the U. S. would provide $40 million while Japan was putting up a bare $5 million to build up its aircraft plants.

Japan's Ministry of Finance wants most of the U. S. assistance in the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Next Steps in Atomic Progress... A Challenge to American Industry

The purpose of this editorial is to throw light on the significance for American industry of recent changes in the statutes that control the development of atomic energy.

The need for clear light on the meaning of this new legislation is made more urgent by the political confusion and distortion that marked its course through Congress. The politically inspired charges of "giveaway" that delayed its passage—charges that were almost totally unrelated to the legislation itself—helped to obscure the vital importance of the step finally taken by Congress.

In sober, post-Congressional fact, the principal significance of the new atomic legislation is that it extends to private enterprise responsibility for the development of peaceful uses of atomic energy, whereas heretofore this responsibility has rested in a tight government monopoly. **And this extension is made on terms that emphasize the responsibility far more than they open any opportunity for economic gain in fulfilling it.** The revised Atomic Energy Act provides that:

1. Industry may now own and operate its own nuclear reactors, under license from the Atomic Energy Commission. And it may build and sell nuclear reactors for export.

2. Industry may use—but not own—nuclear materials at the discretion of the Atomic Energy Commission.

3. The Atomic Energy Commission will make available to industry scientific knowledge that may be useful in developing peaceful applications of nuclear energy.

4. For the first time, industry will have the right to patent inventions in the field of nonmilitary nuclear energy. However, "basic" discoveries must be made available to all companies in the field for a period of five years, after which they, too, will revert to normal patent status.

Two Kinds of Know-How

These provisions, despite the imposed limitations, represent the first positive step toward development of nuclear energy for peaceful applications in the United States. Potentially useful knowledge, previously locked in the minds of government scientists, will now be available to all those who are willing and able to put it to work for the good of mankind.

The advantages to be gained from enlisting the talents of American industry in the development of peaceful atomic applications are imposing. As *The* (London) *Economist*, Europe's leading economic journal, recently remarked, "The atomic scientists are in a position to surmise how atomic energy can be applied... but they lack the specialized knowledge of engineering design and operating technique just as industry itself lacks atomic knowledge." Now the engineers of private industry need no longer lack the atomic knowledge, and there is granted to them at least a restricted freedom to apply it to the solution of their engineering and operating problems.

But the new opportunity for private industry to find constructive uses for the science of nucleonics carries with it a grave responsibility. These uses must be so developed that they will benefit the people of all the free nations. It is essential that the United States, which pioneered in developing lethal uses for atomic fission, demonstrate to the world our paramount interest in its peaceful application. It would be a moral set-back to the free world almost beyond calculation if the Communists should be able to offer to the poorer nations of the world the benefit of low cost atomic power—provided by Communist technicians—while we concentrate primarily on building our stockpile of atomic and hydrogen bombs.

Race For a Peaceful Victory

Most of the experts are agreed that it may be many years—perhaps ten, fifteen or more—before the cost of electricity from atomic fission can be reduced to a level that will make it competitive with conventionally produced power in most regions of the United States. But most of the world is not nearly so fortunate as we are in power resources. Electricity, even at a cost far higher than the average that prevails in the United States, would be a blessing in many countries, and the nation that provides the technology to bring it into being will score a great moral victory.

The useful potential of nuclear energy is not restricted to the generation of electric power—although twenty years from now this use will be highly important to the power industry of the United States. Even with the limited research that has been done in this field thus far, the use of radioisotopes—the radioactive products of atomic reactors—is saving American industry an estimated $100 million a year. Commissioner Campbell of the AEC, who made this estimate, believes that these savings may well reach $1 billion a year within ten years. Radioisotopes are already at work in industries ranging all the way from paper manufacturing, where they measure paper thickness, to pipeline transportation, where they mark the dividing lines between shipments of different products (at an estimated saving of $500,000 a year). Medical applications of these same radioisotopes hold promise of longer and more comfortable lives for those who are stricken by cancer and other diseases.

Above All a Challenge

The new Atomic Energy Act is a crucial stride toward the day when all these benefits—and undoubtedly others not yet revealed by research—will be realized. But it is a step that is essentially permissive. It still leaves it to private industry for the most part to decide what is to be done and how soon.

The new act is thus, above all, a challenge. It confers on private industry the responsibility to assume a leading role in the development of peaceful uses for nuclear energy, a step long urged by NUCLEONICS, a McGraw-Hill magazine devoted to atomic energy. To achieve a success in this task that will measure up to the requirement of the national interest, this development must command all the resources and ingenuity that private enterprise can apply—and do so without promise of glittering prizes surely to be won. **But now that the responsibility has been defined and the challenge offered, American industry will, we believe, measure up to its grave and mighty import.**

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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MILLION-DOLLAR IDEA PAYS OFF

Pan Am's new coast-to-coast "PAY-LATER" PLAN set the stage—*and the pace*—for a brand-new way to sell air travel

If the commercial air industry ever needed a shot in the arm, this is it.

Last May 1st, Pan American inaugurated the first nation-wide, coast-to-coast "travel-on-credit" plan. This plan works in all 48 states and Hawaii, and it was an immediate success. Thousands of people have already signed to fly all over the globe on the Pan Am "Pay-Later" Plan. More than 90% of the sales—nearing the second million dollars—represent *new* business.

Not only has this idea caught on with the flying public, but it has won the approval of the entire industry as well. Within a few weeks, imitations began to crop up everywhere . . . by both U.S.-flag carriers and foreign airlines serving the United States market.

This new trend in travel has widened the market for air transportation and it has put air travel in a competitive position with other day-to-day commodities. Americans have long been accustomed to buying their automobiles, homes and appliances on instalment. Now they can take *bigger and better* vacations in the same way.

And everyone benefits: aircraft makers, carriers, travel agents, tour operators, etc. Last but not least, 180 million Americans benefit through the promotion of greater international understanding and goodwill.

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form of direct dollar grants. But it is probable that any U. S. help would be in yen allocations out of the proceeds from sale of U. S. surplus wheat and other agriculture commodities in Japan.

Japanese air officers say they do not care whether they receive yen or dollar help from the United States as long as they get the money.

▶ **Firms in Program**—By 1958, they anticipate having an air force which will include: 450 F-86Fs; 150 F-86Ds; 173 T-33s; 190 T-28Bs and T-34s; 96 C-46s, and 54 P2Vs.

The Neptunes and some helicopters would be in a navy air arm which may be a part of JADF, rather than under the maritime safety force.

If the Japanese obtain the help which they are seeking, four manufacturers would share the benefits: Mitsubishi Heavy Industries, Reorganized, Ltd., for the North American F-86 and T-28 and the Sikorsky H-19; Kawasaki Aircraft Co. for the Lockheed T-33 and the Bell H-13; Fuji Heavy Industries, Inc., formerly Nakajima Aircraft Co., for the Beech T-34; and Shin Mewia Industry Co. for the Lockheed P2V.

Assistance to the Japanese industry from the U. S. more likely will be considerably less, and much of the Japanese activity, even in 1958, will consist of assembly and repair of aircraft received from U. S. stocks.

Small Firms Can Save Tax Dollars: SDIA

Los Angeles—Small Defense Industries Assn. has urged government action on dangers that face many qualified aircraft subcontractors as a result of being overlooked in mobilization planning.

Hampden Wentworth, chairman of SDIA and president of Longren Aircraft Co., told a press conference the results of a survey show that many small business enterprises are suffering setbacks.

▶ **Lean and Hungry** — Wentworth stressed the importance of recognition by government defense procurement planning agencies of the flexibility and dollar saving advantages of the qualified small defense producer.

"We know from statements made that the next two years are going to be lean and hungry," he said.

He pointed out that for the first time a strata of qualified defense industries have organized representation (AVIATION WEEK Oct. 18, p. 21). Proper utilization of the SDIA, Wentworth said, could build stronger interdependence between the large and small defense manufacturers and produce more defense for less dollars.

▶ **Competitive Chance** — Joining the plea for a stronger small defense plant

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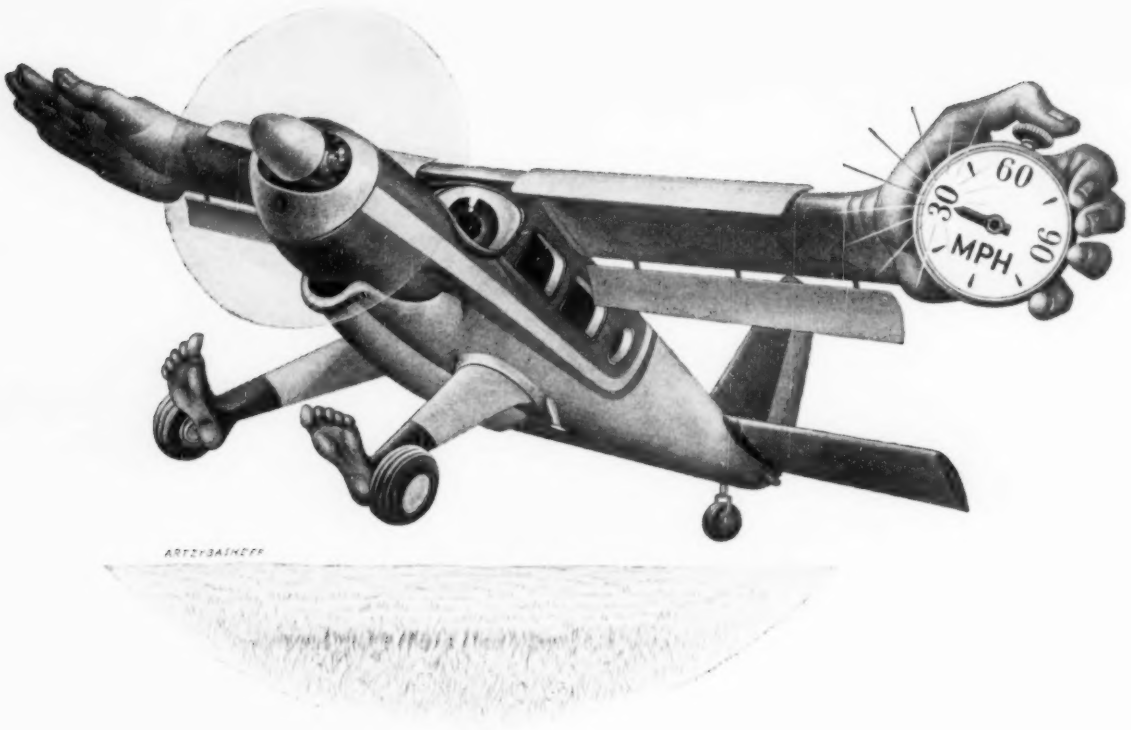

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role was Gen. W. W. Kratz (USAF Ret.), president of Electronic Products Co., Santa Barbara, Calif.

He said the next step of SDIA calls for forming a coordinating committee of representatives from the Air Force, Army, Navy, Department of Defense, Commerce Department, Small Business Administration, Aircraft Industries Assn., Chamber of Commerce and the SDIA. This group would be responsible for finding ways to utilize productive potential of small plants to the maximum extent.

"We do not ask for coddling or handholding. All we want is a competitive chance," he said.

▶ **Less Profit**—George Wing, president of High Shear Rivet Tool Co., reported on his contact with the office of the Assistant Secretary of the Air Force for Materiel.

Wing appeared concerned over statements that indicated the subcontractors and suppliers would be the first to feel the effects of production cutbacks. "Smaller subcontractors are able to produce parts more economically, but that the government is allowing the primes less profit on subcontracted items," he said.

Wing suggested that large contractors be given more profitable incentives and not be penalized profitwise for dealing with the small defense producer.

Lee Predicts Stable Airport Aid Program

Federal airport aid should be continued in fiscal 1956 "on a scale at least as large as at present," says Civil Aeronautics Administrator Fred B. Lee. The airport aid appropriation for fiscal 1955 was $22 million.

Lee reports that in view of President Eisenhower's plan for an extensive program of highway improvements, ". . . all forecasts agree that the same trend will be felt in civil aviation, and there is every reason to believe that this Administration will show the same foresight and aggressiveness in pushing a program to meet resulting airport needs."

Budget Bureau now is considering the Commerce Department appropriation request for the next fiscal year, to be presented to the new Congress when it meets in January.

▶ **'Special Situations'**—Lee told the Airport Development and Operation Conference in Syracuse, N. Y., that there are "special situations" to be considered in determining eligibility for federal aid.

The Commerce Department's airport panel recently recommended that "national interest" should be the determining factor. Commerce has developed cutoff points of 3,000 annual

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THIS IS ONE of many Stainless Steel nozzle assemblies for jet engines built by Ex-Cell-O Corporation, one of the world's largest producers of aircraft precision parts.

There's *something* of *Ex-Cell-O* in practically every plane made in the U. S. A. today.

Illustrated below are typical blades, nozzles, hydraulic actuating assemblies and fuel control assemblies, precision built by Ex-Cell-O Corporation to aircraft builders' rigid specifications.

53-1

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PROVIDES A COMPLETE
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CHECKS ALL ILS RECEIVERS (Including Marker) ANTENNAS AND CROSS POINTER INDICATOR

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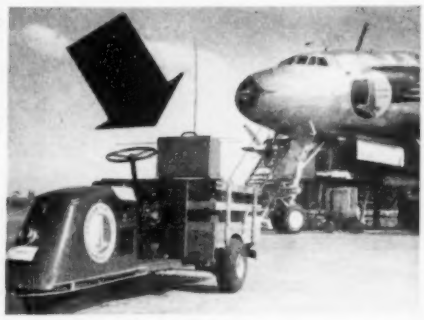

Test Set is Portable — Weight 38 lbs. — Power required — 6v DC only. Has provided reliable operation since 1948. Over 100 sets in current use.

Used by CAA approved repair stations, modification, service centers and military.

USED BY LEADING AIRLINES OF THE WORLD
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enplaned passengers per year and a based aircraft population of 50 aircraft as a suitable criteria in determining aid qualification (AVIATION WEEK Oct. 18, p. 34).

The "special situations," Lee says, would include:

- Airports that have definite value as emergency fields along routes with substantial air traffic.
- Airports with seasonal traffic that is very active only during certain periods.
- Airports where air cargo, rather than passengers, indicates their importance.
- Other cases where the measurement of passengers and aircraft does not indicate the true degree of activity.

"These criteria," the CAA Administrator says, "provide a basis for concentrating the program upon airports of national significance. There are some 760 airports throughout the country which would satisfy the criteria, without considering additional airports which might qualify because of special modifying factors."

▶ **Operational Factors**—Lee reports the programming standards for work to be accomplished are aimed at national, rather than local, importance.

"By excluding such items as terminal buildings, auto parking areas, utilities and other items of predominately local interest, the program can be concentrated upon development which involves the safety of air operations—such as approach protection, runways, taxiways, lighting and related facilities."

Prime need now is the improvement of existing facilities, Lee believes. The 1953 National Airport Plan lists 2,060 conventional airports as needed, of which 1,765 are in existence and only 295 would be new facilities.

Improvements most urgently needed, Lee claims, are:

- Longer runways of adequate strength.
- Taxiways to facilitate ground movement.
- Bleedoff taxiways to insure quick exits from runways.
- Clear approaches to runways.
- Adequate ramp areas to accommodate ever-increasing numbers of aircraft.

Administrator Lee also reveals that CAA is considering raising its estimate of passengers to be carried by airlines in 1960 from 40 million to 50 million.

Weather Experiment

Transmission of the latest aviation weather and notices to airmen by continuous voice broadcast from a low-frequency radio range at Arcola, Va., has been inaugurated as an experiment by Civil Aeronautics Administration and the Weather Bureau.

Broadcasts are being made from 6 a.m. to 6 p.m. on 233 kc. Service includes flying weather forecasts for an area within 250 mi. of Washington.

Smooth Power... Big Lift

- New Cessna 180 Gets Off Quickly, Cruises Quietly With 4 Passengers And Luggage
- Out-Performs Any Other 4-Place Airplane—Yet, it's Priced $6000 Under Competition!

Cessna
AIRCRAFT COMPANY

Now, Cessna 180 challenges comparison! Offers you faster take-offs... shorter, slower landings... longer range with a greater load... more stability... better high-altitude performance, than any other 4-place airplane on the market! PLUS smoother, quieter performance, *over* 150 m.p.h. cruising speed, full 4-place comfort, sparkling new colors and styling, dozens of new improvements. Yet the powerful 1954 Cessna 180 is priced at only $12,950—actually $6000 under its nearest "over 150 m.p.h." competitor! See and fly the new Cessna 180 at your nearest Cessna dealer's today (he's listed in the yellow pages of your telephone book). For more information, write CESSNA AIRCRAFT CO. Dept. AE-10, Wichita, Kansas.

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Center of Gravity

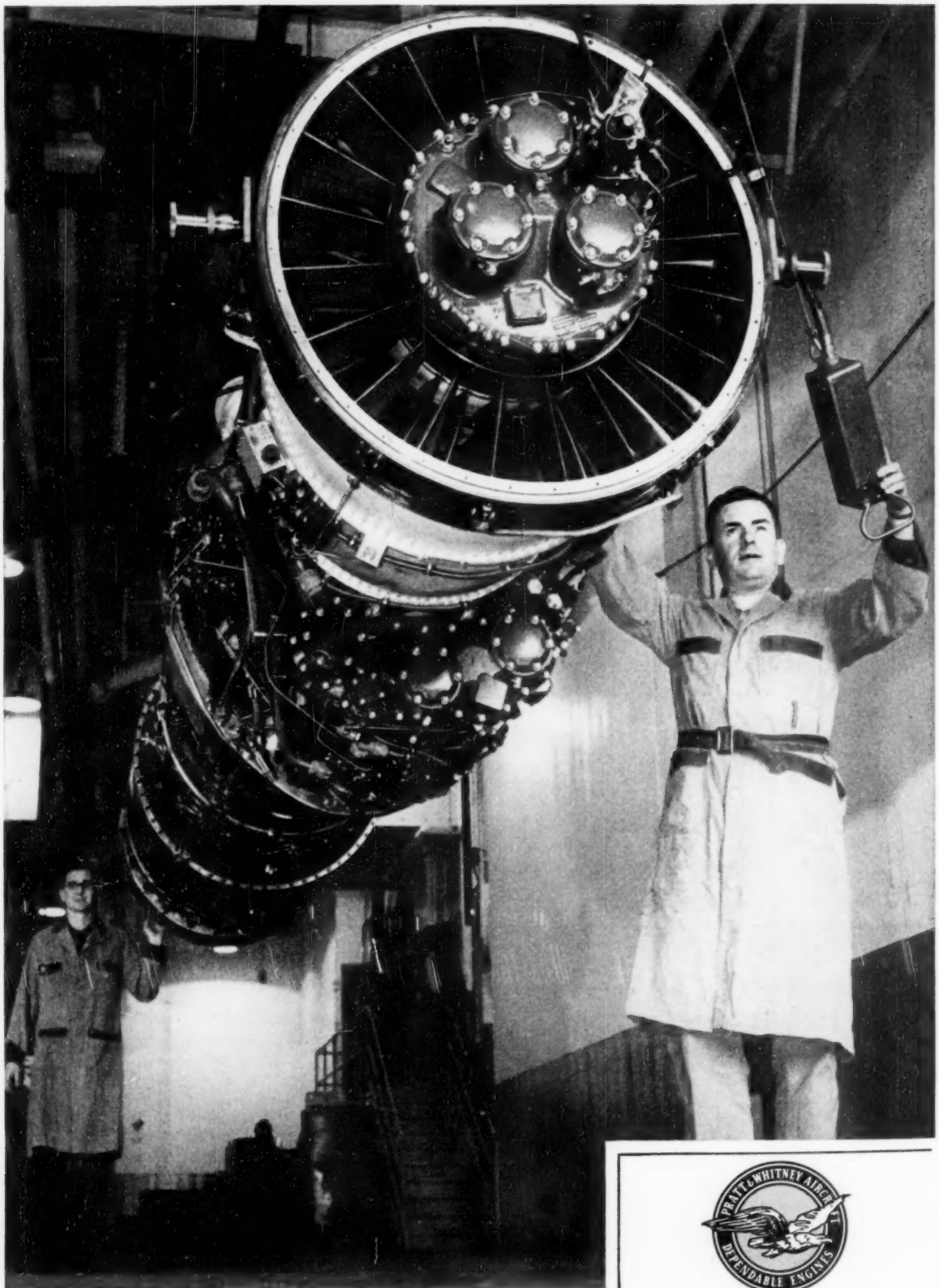
High Wing—Soft Ride

With Cessna 180 high-wing design, center of lift is *above* center of gravity, providing greater stability, smoother flight, freedom from pitching and rolling. High wing also protects you from sun heat and glare, improves your view. Extra soundproofing has been added and the Cessna 180's large heating-ventilating system (6 outlets and defroster) keeps cabin temperature comfortable regardless of altitude or weather.

New "Easy Access" Luggage Door

Conveniently located on the pilot's side. You can load from the inside, too! Large compartment holds 120 lbs. of luggage. Or, by removing the rear seat, you can load 500 lbs. of cargo in the Cessna 180! Optional equipment for the 180 includes skis, floats, provisions for ambulance, photographic and crop-spraying work.

4 GREAT CESSNAS 170 180 195 310 THE COMPLETE AIR FLEET FOR EVERY BUSINESS NEED



One 10,000-lb. thrust class Pratt & Whitney Aircraft J-57, equipped with afterburner for combat ratings of tremendous additional power, is the heart of the Super Sabre's supersonic performance.

PRATT & WHITNEY AIRCRAFT
DEPENDABLE ENGINES

ONE OF THE DIVISIONS OF
UNITED AIRCRAFT CORPORATION

Sharply swept-back wings and tail surfaces mark the North American F-100 Super Sabre. Built around one Pratt & Whitney Aircraft J-57 turbojet and afterburner, the Super Sabre is the Air Force's first operational supersonic jet fighter.

Super Sabre Has Supersonic Performance

Sustained level flight above Mach 1 is a vital attribute of the latest U. S. fighting aircraft, and North American's F-100 Super Sabre has it.

Such hard-won capability—possessed by only a few production aircraft—is the product of highly advanced airframe design wedded to a flexible, efficient turbojet engine of enormous power.

The sleek Super Sabre is now being built in quantity for the U. S. Air Force. Equipped with the Pratt & Whitney Aircraft J-57 turbojet and afterburner, it has already set the world's speed record of 755.149 miles per hour—an enviable beginning for a fighter on which so much depends.

In the Super Sabre, as well as in other supersonic fighters and high-speed jet bombers, performance of the Pratt & Whitney Aircraft J-57 turbojet is fully justifying the long years and intensive effort required for its development and production.

Pratt & Whitney Aircraft

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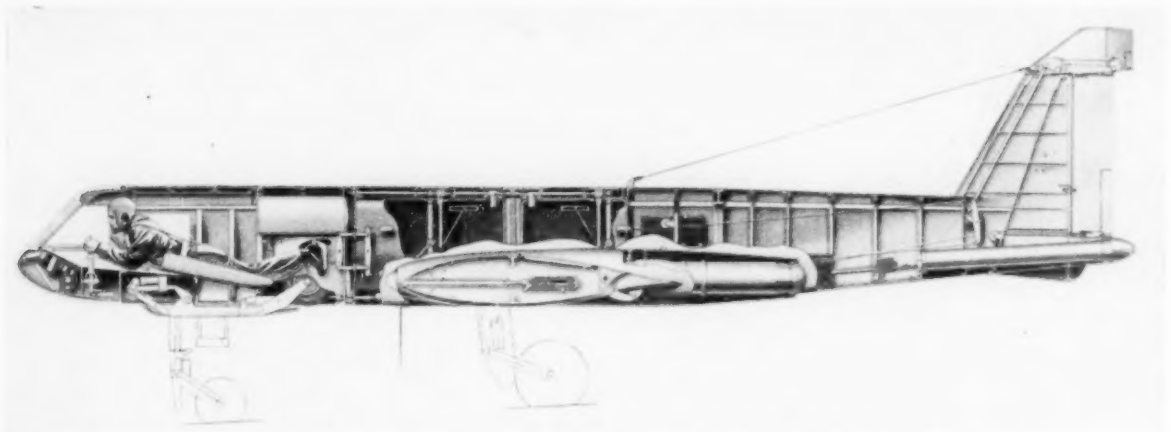
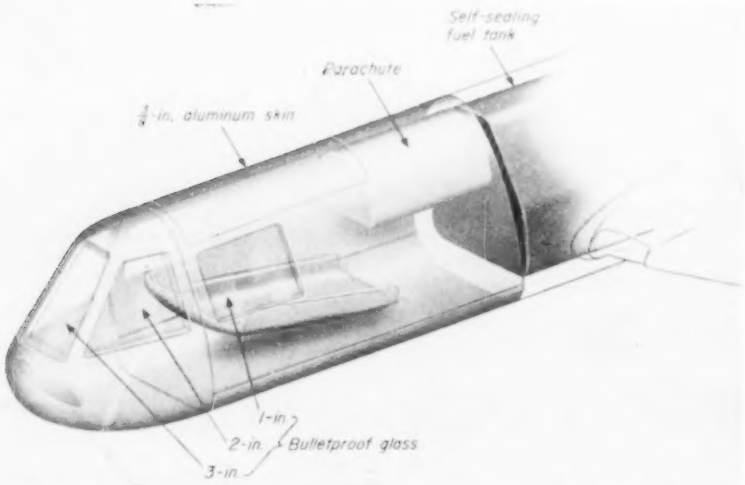
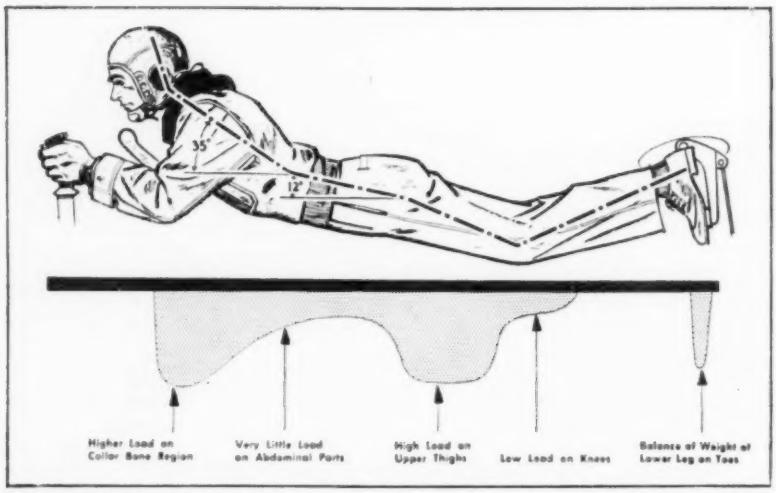
In Canada: Canadian Pratt & Whitney Aircraft Co., Ltd.



PILOT LIES PRONE in Midget, Martin close-support proposal. Though never built, its design features still make sense today.



NOSE CAPSULE is designed for maximum pilot protection. Pilot bed is thick plastic.


35°
12°
Higher Load on Collar Bone Region
Very Little Load on Abdominal Parts
High Load on Upper Thighs
Low Load on Knees
Balance of Weight of Lower Leg on Toes

PILOT SUPPORT is made of reinforced plastic padded with foam rubber for comfort.

Martin Midget

By Irving Stone

Baltimore—The trend both here and abroad toward lightweight, simple combat planes for specific jobs is evidenced in an unusual design proposal submitted to the Air Force by the Glenn L. Martin Co.

Martin's specific design concept—a close air support weapon—is as valid today as it was when submitted about two years ago. Brought up to date, it probably would be faster, include wing sweep, and have better loiter characteristics than the original proposal promised.

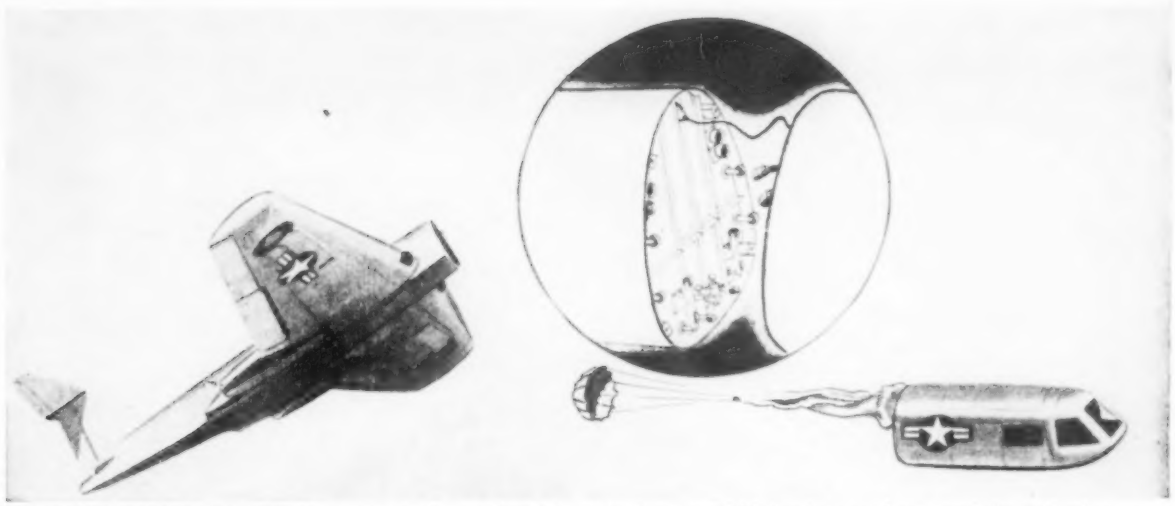
The Air Force liked the design, Martin reports, but the plane was not built because budget funds were not available at the time. Also there was no small jet engine available with sufficiently low fuel consumption, it is said.

Nevertheless, the design highlights numerous features of top interest to both designer and tactician.

▶**More Difficult Job**—Known as the Mighty Midget, the aircraft is a heavily armored, prone-pilot configuration, only 28 ft. long and with a 23-ft. span, powered by small twin jets for an over-500-mph. speed at sea level. Maximum useful load of 4,060 lb. exceeds its empty weight, and maximum endurance at sea level is 3¼ hr.

The weapon's job: Provide more effective close air support for friendly ground forces under conditions of modern warfare.

Martin saw it this way: While the striking power of bombers and fighter-bombers forces decentralization and dispersion of enemy ground forces, this



EMERGENCY ESCAPE FEATURE allows pilot to be parachuted in protective nose which breaks away from remainder of fuselage.

Tailored for Close Support

situation also gives rise to a tactical condition making the enemy more difficult to locate and destroy—from the air as well as on the ground.

For adequate close air support of ground forces, Martin felt a new plane was needed; improvising such a weapon by adapting existing aircraft for the job did not produce the desired weapon efficiency.

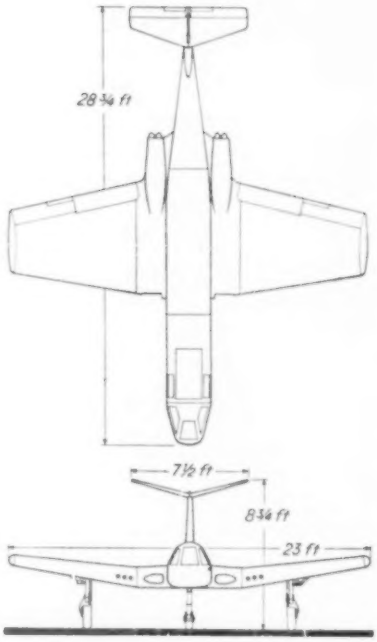
▶ **Spot and Attack**—The close support weapon contemplated by Martin designers would combine the best features of target spotter and attack plane types. It would locate, identify, and mark targets for concentrated attack; destroy "targets of opportunity," such as a motor convoy.

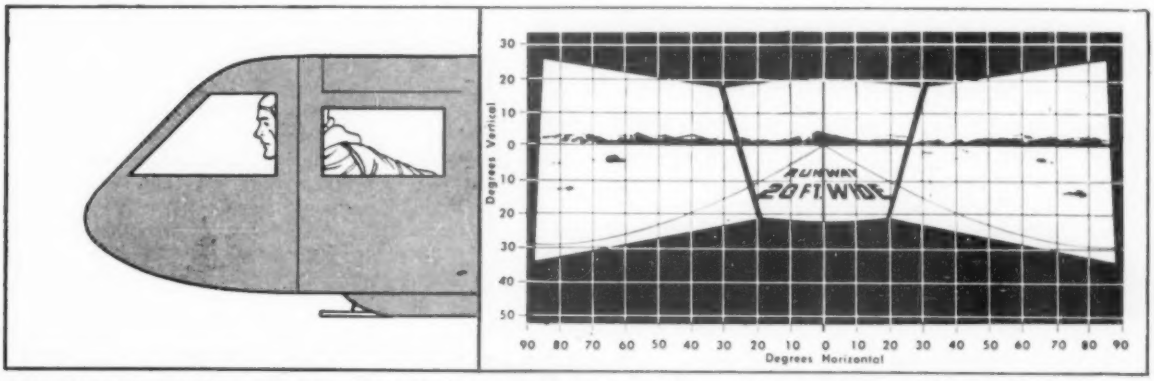
As an anti-personnel weapon it would carry six forward-firing machine guns with combined firing rate of more than 8,000 rounds per minute.

As an anti-tank vehicle, it would tote two cannon, rockets or napalm. For anti-strongpoint work it would have a large bomb or rocket load in addition to machine guns or cannon.

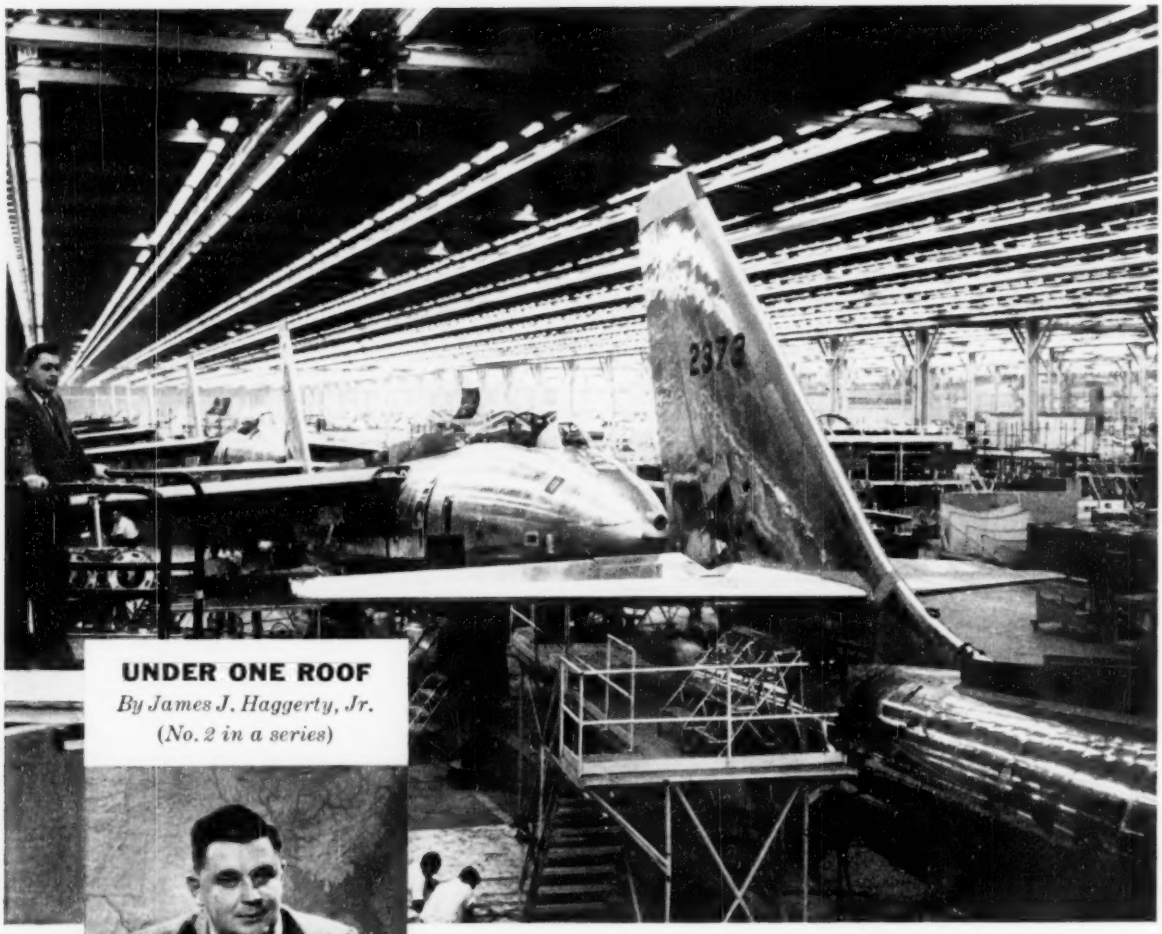
▶ **Midget Characteristics**—As projected by Martin engineers, the Midget would possess:

- **Maneuverability** associated with an "ideal" crop duster. The plane would have a 12G airframe, have a prone-pilot position.
- **Little vulnerability** to enemy ground and aircraft fire. A heavily armored nose capsule affords protection from .50-cal. and 20-mm. ground fire.
- **Mounting provisions** for a wide variety of armament, including athwart guns for sidewise firing.
- **Short-field takeoff** and landing characteristics for operation from forward areas.
- **Adequate pilot-escape** provision in the form of a chute-fitted jettisonable nose capsule.
- **Rugged,** simple airframe for high





PILOT'S VIEW from Midget nose gives wide field. Nose capsule has five windows, with two side glasses minimizing blind areas.



UNDER ONE ROOF

By James J. Haggerty, Jr.

(No. 2 in a series)

"Room for 70 football fields under this roof – room to build bigger bombers and transports"

Says James J. Haggerty, Jr., Aviation Staff Writer, Collier's

One football field covers more than an acre, yet in Marietta, Georgia, there's an aircraft plant with a single building that could house 70 football fields.

This statistic is just as important as it is amazing – important, of course, to U. S. defense. The plant was built big by the government for a purpose – to manufacture big multi-engine airplanes in quantity with utmost speed and efficiency.

Today GAP-6 (Government Aircraft Plant No. 6) is operated by Lockheed for the U. S. Air Force, is building big turbo-prop C-130A assault transports and six-engine B-47 jet bombers, more than half the parts being made under the same big roof. Another production line modifies early B-47's, and there's still room for a fourth production line.

GAP-6 is not just big for bigness' sake but for production efficiency. And the record made there in the last three years proves the advantage of "everything under one roof"... (1) first B-47 flown 60 days ahead of schedule; (2) subsequent and current production all on schedule; (3) now building planes with 25% of original man-hours; (4) learning curve now 73% and still going down, well under the 80% industry average; (5) third best safety record in the entire industry.

Already a vital part of America's defense industry, GAP-6 can easily produce even more and bigger planes for U. S. protection.

U.S. Air Force
Govt. Aircraft Plant No. 6

Lockheed
Aircraft Corporation

Georgia
Division, Marietta

(a Lockheed advertisement)

SIDE-FIRING GUNS eliminate time-consuming maneuvers, allow continuous short-range attack on entrenched personnel.

utilization, little maintenance.

• **Low-cost** characteristics.

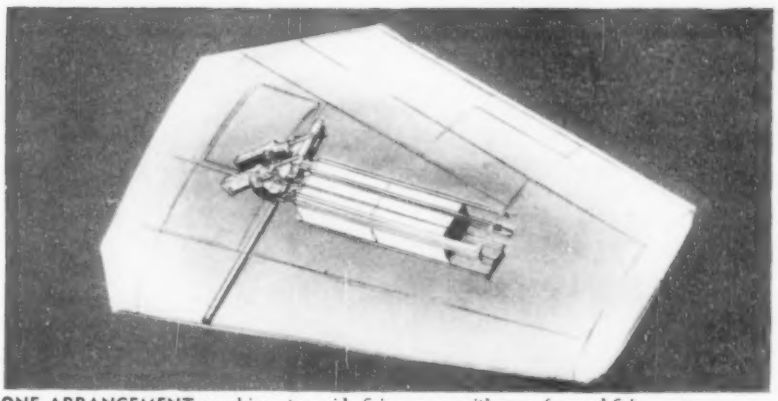
▶ **Armored Enclosure**—Pilot protection is emphasized in the design. Cockpit is a heavily armored, jettisonable capsule housing an automatically released chute. It is intended to protect pilot from all small-caliber fire aimed from any probable ground fire direction.

Nose is constructed of 1-in.-thick Fiberglas-reinforced laminate contoured to take most of probable ground fire hits as glancing shots, stop all but direct .50-cal. and 20-mm. hits striking with an impact velocity equivalent to muzzle velocities of such guns. Direct .50-cal. frontal hits will penetrate the plastic laminate, the design data says, but will be stopped by a ¾-in., canted, aluminum alloy plate.

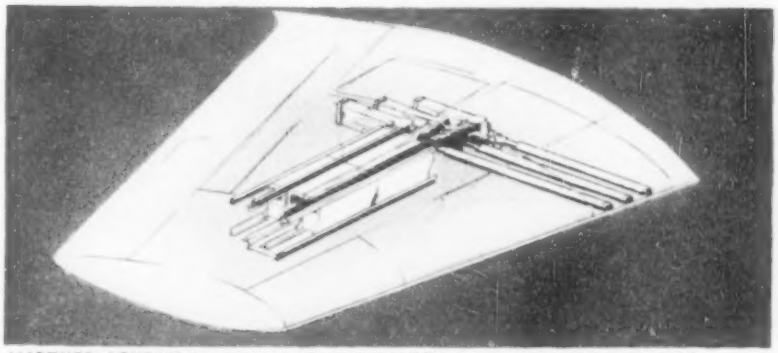
Windows are bullet-proof glass for protection against head-on hits from gunfire as large as 22 mm. Front window is 3 in. thick; two adjacent side windows are 2 in. thick; aft side windows are 1 in. thick.

Nose capsule skin is ⅜-in. aluminum alloy, intended to deflect point blank projectiles up to and including 20 mm. and at angles up to 20 deg.

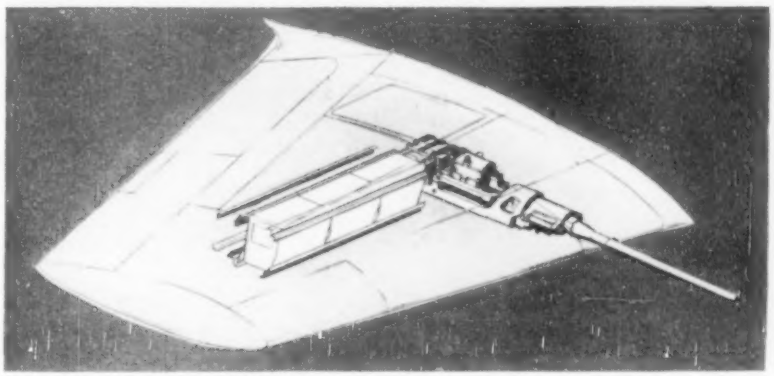
▶ **Body Bed**—Pilot's support—⅝-in. Fiberglas-laminate bed padded with foam rubber—is contoured for minimum body tiring, best body weight distribution, high-freedom of action, maximum resistance to effects of high ac-



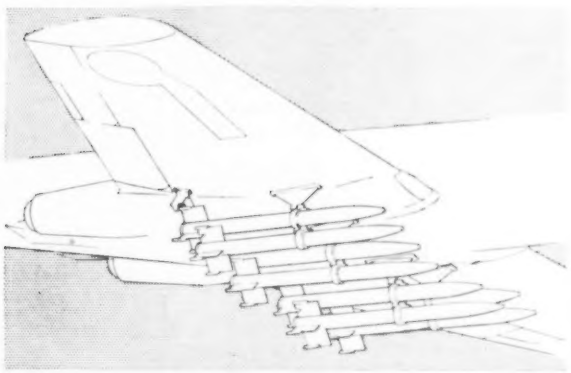
ONE ARRANGEMENT combines two side-firing guns with one forward-firing gun.



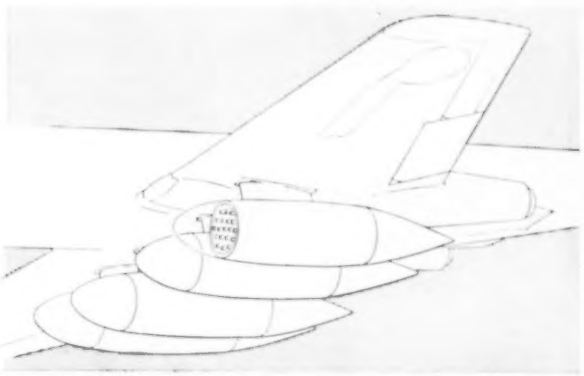
ANOTHER SCHEME incorporates three forward-firing guns in each wing panel.



CANNON is installed quickly in switch from machine guns. Unit has 300 rounds.



EIGHT ROCKETS, 5-in. HVAR units, can be toted by Midget.



ALTERNATE ARMAMENT PLAN allows for rocket clusters.

WE'RE LOOKING FOR ENGINEERS WITH ABILITY

Stratos—now developing new air-conditioning systems, air-turbine drives, controls and other pneumatic accessories for aircraft and industry — is interviewing well-qualified men as

RESEARCH ENGINEERS

For investigations and studies in pneumatic refrigeration and very high speed power turbines.

PROJECT ENGINEERS

Several — Intermediate and Junior.

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Seniors and Juniors.

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Excellent housing available in area. Convenient to New York City. Wonderful recreational facilities. Fine beaches — Fishing, Boating, Golfing.

STRATOS

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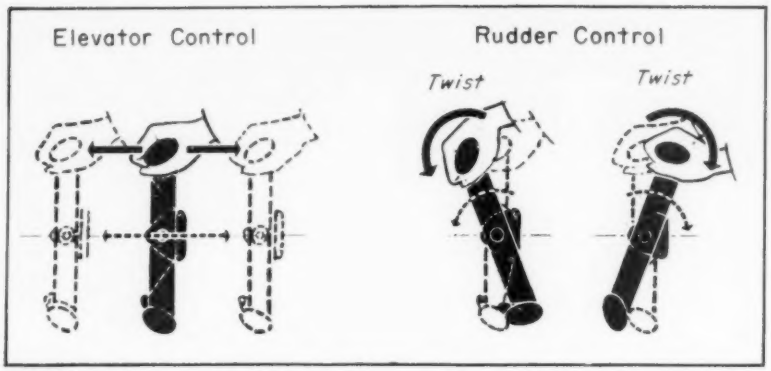
Manufacturers of air-conditioning equipment and pneumatic accessories for high speed aircraft.



CONTROL for elevator and rudder may be operated by one hand, as shown in diagram.

celerations. It is designed to absorb head and upper torso shock forces from capsule chute-landing or aircraft belly landing. Pilot's body is held in the support by safety belts to prevent slippage at impact.

Protection is afforded by the support from any .50-cal. direct hits from below, if they penetrate the bottom skin and miss the retracted nose gear.

Chin rest may be lowered out of the way, is designed to provide most comfortable head position and best line of sight. Windshield posts disappear almost completely from the field of vision, Martin says, due to the different refraction angles in the forward and side panels. Side panels give broad viewing field directly left and right and toward the rear.

▶ **Capsule Release**—Emergency release control for the chute-equipped nose capsule detonates four explosive bolts connecting the capsule to the fuselage, also raises pilot's chin rest to act as a support for his head at impact.

The instant the tension load on the four explosive bolts is relieved by the firing, all electrical leads and control lines between capsule and fuselage are parted at quick disconnects. There are no flammable-fluid lines between the two body sections.

The 60-ft.-diameter chute is ejected automatically, opens in 3 to 4 sec., has a letdown rate of 25 fps. After landing, the capsule serves as an armored shelter. It is fitted with small arms, first aid supplies, and emergency provisions.

▶ **Control Details**—A simple three-dimensional hand-and-arm control system is used. Two of the three control movements—elevator and aileron—are same as with conventional control stick, while the third, for the rudder, follows the bicycle handlebar movement.

A pistol-grip twist is used to dis-

(Continued on page 55)

Martin Midget—Specifications

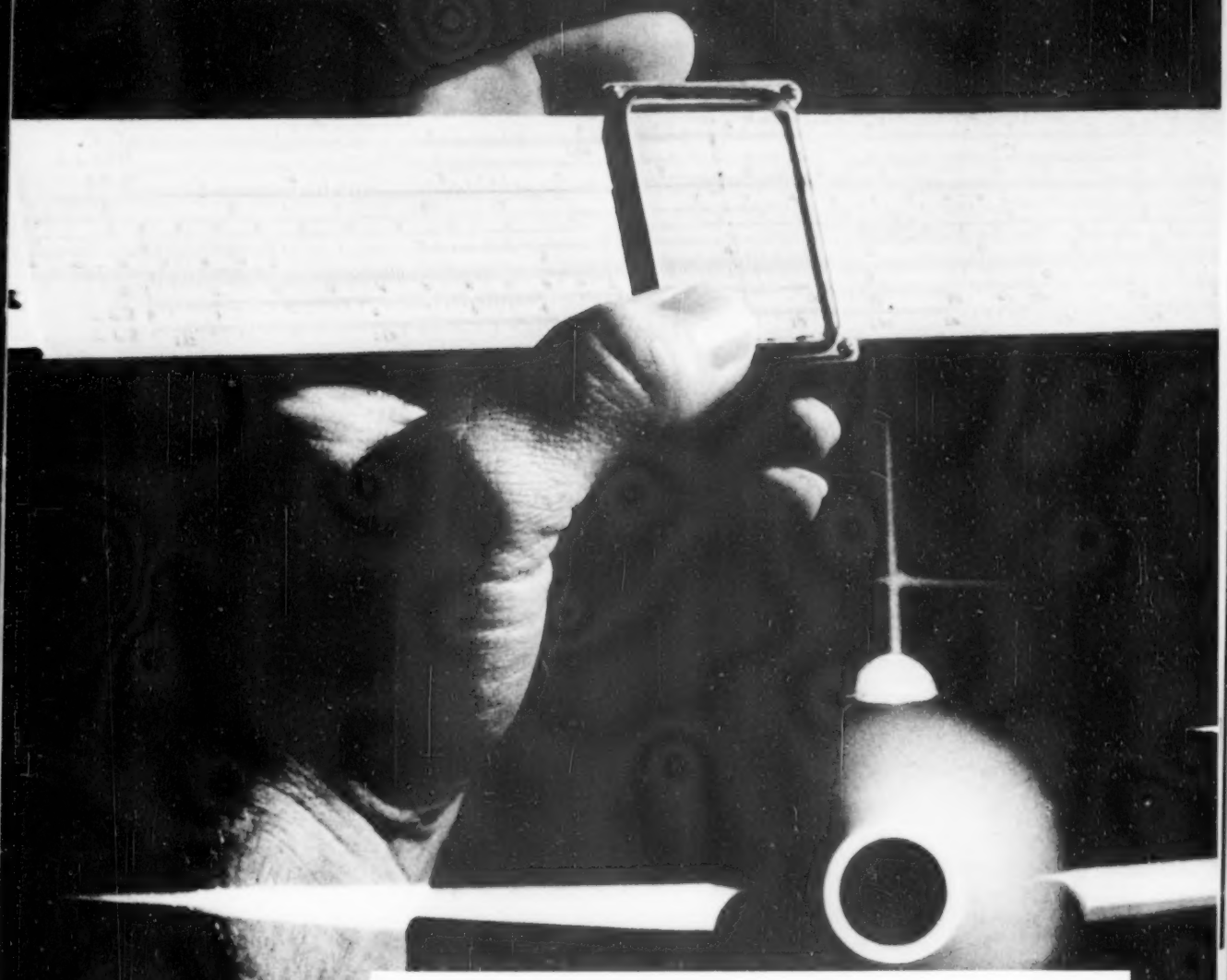
Weight empty, lb	3,666
Design gross, lb	5,686
Maximum alternate gross, lb	7,726
Design useful load, lb	2,020
Maximum alternate useful load, lb.	4,060
Total military thrust (static sea level conditions), lb	2,050
Total thrust with afterburner (static s. l.), lb	3,280
Maximum horizontal speed (s. l.), mph.	512
Minimum steady state turning radius, ft	655
Bank angle for minimum turning radius, deg	63.0
Maximum endurance (s. l.), hr	3¼
Average speed for maximum endurance, mph	186
Takeoff ground run, ft	920
Takeoff distance (to clear 50-ft. obstacle), ft	1,260
Landing roll, ft	990
With parachute brake, ft	380
Landing distance (to clear 50-ft. obstacle), ft	1,530
With parachute brake, ft	915
Stalling speed (with landing flaps), mph.	90
Maximum rate of climb (at design gross), fpm	4,830
Speed for maximum rate of climb, mph.	265
Combat radius (s. l.), mi	180

Includes:

1.—Five minutes at normal rated thrust at static seal level conditions.
2.—Calculated takeoff fuel with augmentation.
3.—Cruise-out at best range speed at sea level.
4.—10 min. at maximum rated thrust at sea level.
5.—10 min. loiter at maximum endurance.
6.—Cruise-back at best range speed at sea level.
7.—Reserve:
   a. 5% fuel reserve.
   b. Fuel for 20 min. loiter at maximum endurance.

(All values of sfc are increased by 5%)

TOMORROW'S AIRCRAFT: *One step closer*



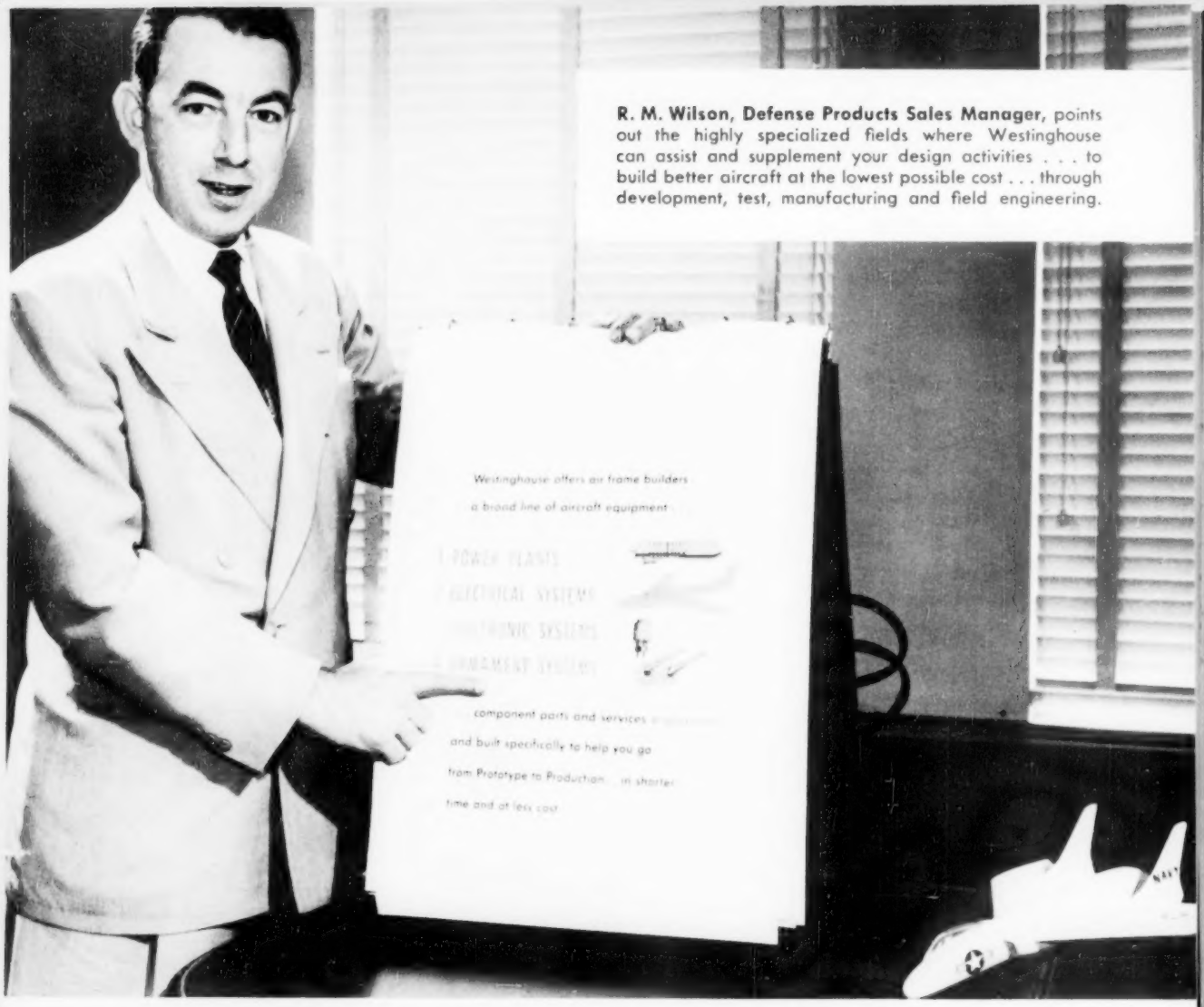
Prototype to production . . . in shorter time and at less cost

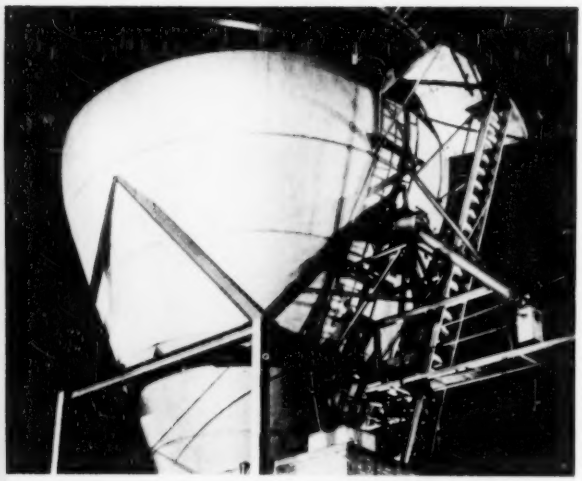
During systems study or systems development, project engineers face this challenge: Where to look and how to get the best of what's new? There's one unique source for the latest in technology and products . . . Westinghouse. Unique because of two vital factors: Unparalleled research and development facilities; and product families covering every phase of aviation—especially airborne electronics, electrical systems and motors, and airborne propulsion systems.

NOW . . . find out more about this unique source and the four big ways Westinghouse can help you . . .

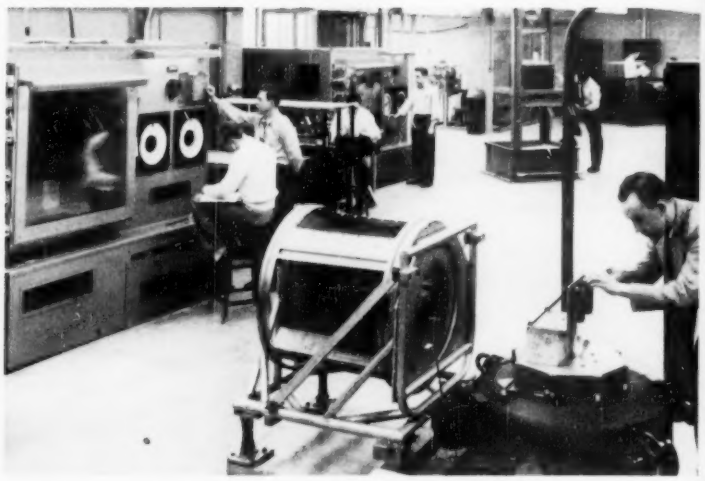
Westinghouse

R. M. Wilson, Defense Products Sales Manager, points out the highly specialized fields where Westinghouse can assist and supplement your design activities . . . to build better aircraft at the lowest possible cost . . . through development, test, manufacturing and field engineering.


Westinghouse offers air frame builders
a broad line of aircraft equipment
component parts and services
and built specifically to help you go
from Prototype to Production . . . in shorter
time and at less cost



The Van de Graaff generator of the Westinghouse Research Laboratory has long been recognized as the symbol of scientific pioneering undertaken by the Corporation. Efforts spread over the whole realm in search of new knowledge . . . much of which has contributed to the advancement of aviation.



At Air Arm Division, environmental type-test laboratories have every possible facility to test components and complete systems to the most rigorous specifications. This includes impact, vibration, sand and dust, salt spray and acceleration—with tests and evaluations being made throughout development and production.

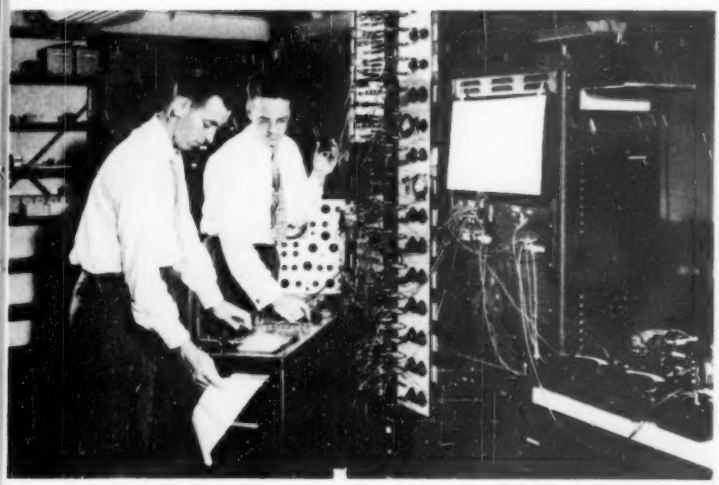
Development labs constantly advance state of the art . . . are prime source of better systems concepts

Westinghouse has a basic credo: To develop the type of equipment and complete systems which will help airframe and equipment builders meet military and commercial specifications. Emphasis is on sound progress with the highest possible degree of dependability. To implement this, Westinghouse has over twenty-three laboratories working in every area where aviation may possibly be advanced, and these labs are staffed and equipped with attention to every skill and necessary device. The result: History has shown that Westinghouse research and development contribute continually to aviation progress—is a prime originator of new ideas and concepts. Here, then, is a potent source for better equipment and improved aircraft performance, from an experienced supplier capable of giving you the most for your aircraft dollar.

But what about test and evaluation? . . .

YOU CAN BE **SURE**... IF IT'S

Westinghouse

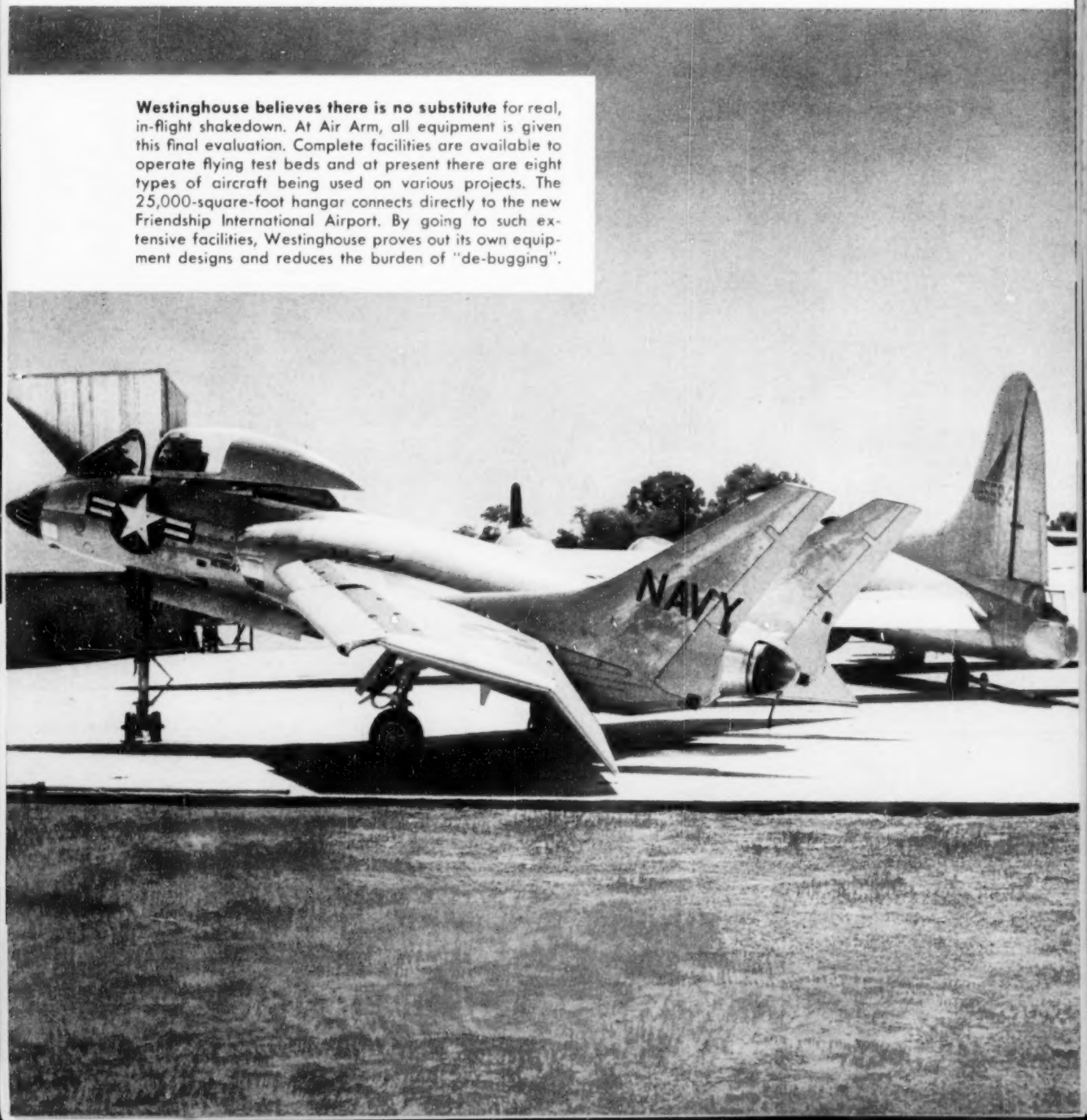


Westinghouse experience and facilities are invaluable when new concepts need a head start. Here, engineers skilled in the particular problems of aircraft electrical systems analyze a new project in the research room—with an analogue computer for running the gamut of every possible parameter—the first step toward design qualification.

The Aviation Gas Turbine Headquarters has one of the country's largest and most complete model shop facilities. A complete factory in itself, it is the center of continuing development and product improvement. New ideas are taken from design layout to prototype stage, then evaluated by actual performance testing.

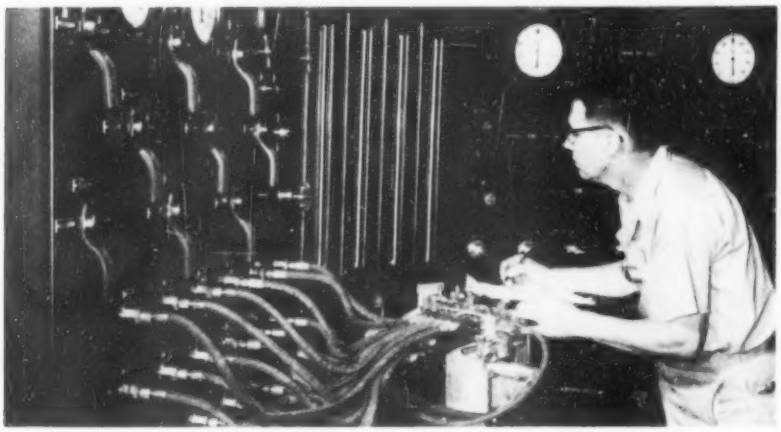
Every known test used to prove components, qualify products . . . from concept to actual service

Westinghouse believes there is no substitute for real, in-flight shakedown. At Air Arm, all equipment is given this final evaluation. Complete facilities are available to operate flying test beds and at present there are eight types of aircraft being used on various projects. The 25,000-square-foot hangar connects directly to the new Friendship International Airport. By going to such extensive facilities, Westinghouse proves out its own equipment designs and reduces the burden of "de-bugging".



From long experience, Westinghouse knows the best plan is side-by-side development, test and evaluation—for no product or system is better than its ability to perform to specifications. Each Westinghouse Division has complete facilities—many of them Westinghouse-developed—for all required mechanical and environmental tests, simulating every possible airborne situation. Reliance is always placed on proved components and qualified products as the soundest answer to advancement. This Westinghouse test and evaluation concept is applied to products and systems at every stage of development and on through manufacture to actual service. It is one of your best guarantees that this source of ideas and products offers unusual "extras" in reliability, can give you extensive help in meeting the rugged test of specifications—all the way.

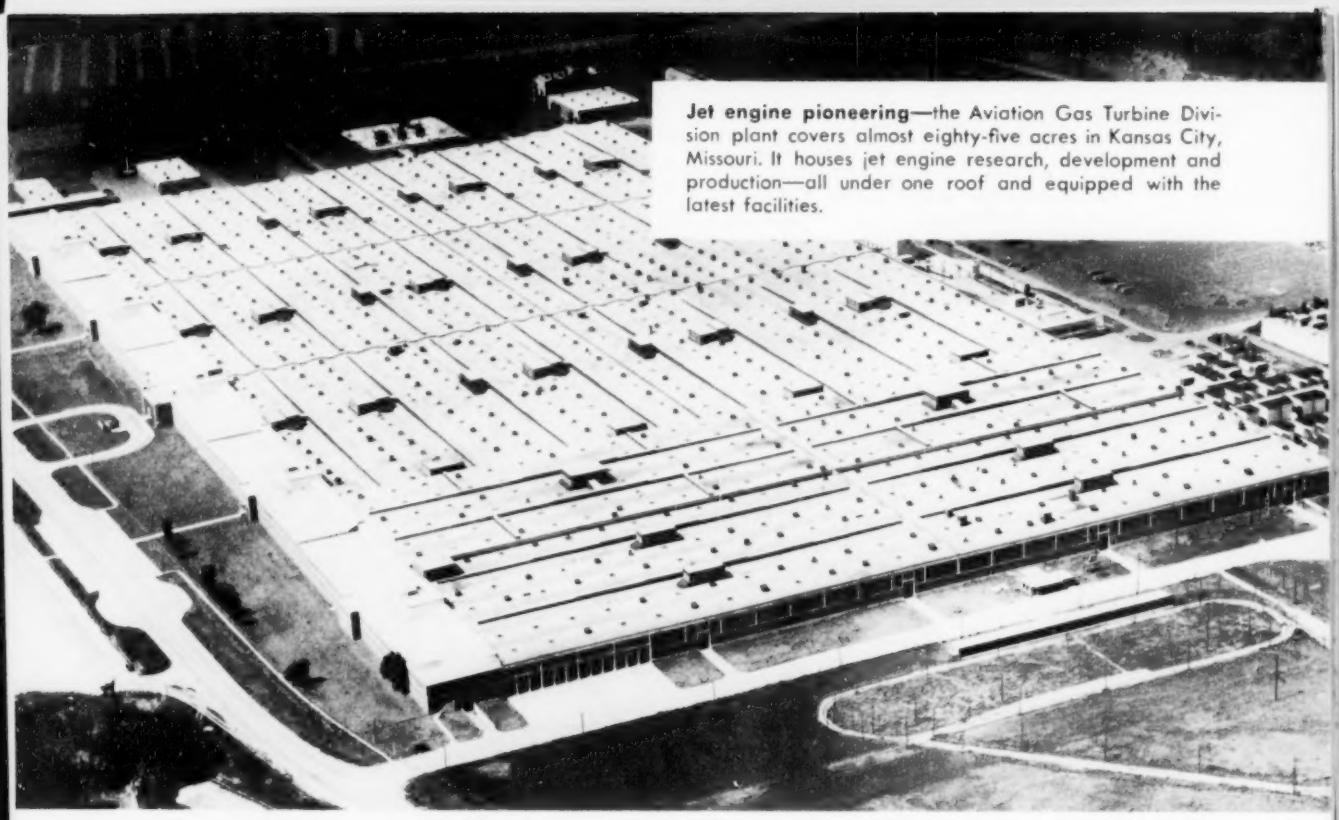
YOU CAN BE SURE...IF IT'S Westinghouse



The Aviation Gas Turbine Division—like all Westinghouse Divisions—places great stress on test, evaluation and qualification of all components and products. Here, a jet engine accessory is being given a complete operational check prior to release for installation. This same attention to performance follows every engine from development through production, where completed engines are given two complete test cell runs to prove that they meet specifications.

Life testing of all electrical apparatus plays a vital part in the Aircraft Department of the Small Motor Division. Highly specialized facilities—similar to the one shown above—test generators and motors under full load to determine brush life and stamina. The results are then cross-checked with other evaluations, such as high altitude chamber tests. Complete systems and their components can be tried and proved for performance under any climatic or mechanical environment.

Now, the end result of all this . . .



Jet engine pioneering—the Aviation Gas Turbine Division plant covers almost eighty-five acres in Kansas City, Missouri. It houses jet engine research, development and production—all under one roof and equipped with the latest facilities.

Specialized plants and corporate facilities give capacity, flexibility . . . produce to specifications

Westinghouse in aviation also means the best and most complete plants and production facilities capable of building precision and ruggedness into every product. The Westinghouse aviation family offers three-way flexibility to assure both quality and quantity: Twenty-three divisions specialize in their product lines; strategic locations and special headquarters facilities put product "families" close together, make it possible to utilize skills and capacity of other plants whenever necessary; modern production equipment takes full advantage of new techniques, constantly produces to close specifications. These are all big reasons why Westinghouse can offer such extensive help in backing up your design efforts on new aircraft.

The Air Arm Plant in Baltimore integrates all airborne electronics activities under a single, Westinghouse-owned roof. Complete development, test and manufacturing facilities are available to you, the finest anywhere in the industry.

The Small Motor Division at Lima, Ohio, combines experienced technology, modern equipment and extensive "mock-up" facilities to design and build highly advanced aircraft electrical systems, drives, motors and controls.

Engineering follow-thru insures performance, gives user full value of equipment and systems

From prototype on, Westinghouse field engineering is of vital assistance in helping you qualify the aircraft for operational service. Engineers are highly skilled in their product lines, ready to provide all necessary assistance for successful use of products and systems. This also is a Westinghouse credo: To assure product performance, to give the user benefits of continuing technical advances in design and application, and to assist in training of operational and maintenance personnel. By providing this full measure of service, Westinghouse can intelligently and sincerely offer airframe and equipment manufacturers a complete partnership, directed toward selection and application of the best possible equipment and systems for the job.

Now . . . see how to put Westinghouse on your team . . .

YOU CAN BE **SURE**...IF IT'S Westinghouse

Look to Westinghouse—get newer concepts, better systems for greater margins of technical superiority . . . prototype to production

By now we're sure you realize . . . aviation is very much our business. These Westinghouse facilities—barely covered here—offer you a real, hard-working source for solving aviation problems. Advancement comes both from individual product developments and from basic areas like metallurgy, fuels, combustion and nuclear energy. Much of it, of course, is classified, but readily available for use by qualified recipients.

The real story here is how we can help you. Whatever your problem, at any stage of design or modification—whether in airframe work or equipment manufacture . . . it's a good bet that Westinghouse can give you valuable assistance. But most important, Westinghouse has the unique capability to help you all the way—all the way from prototype to production, and help you do it in shorter time and less cost.

Here is the Westinghouse Aviation Family, covering every phase of aircraft operation:

Basic aircraft systems

Turbojet Engines • Fire Control • Radar • Autopilots • Communication Equipment • Electrical Systems • Defensive Systems and Guided Missile Components.

Airborne system components

Transformers • Rectifiers • Instruments • Gyro-motors • Temperature Control Panels • Generating Equipment and System Control • Circuit Breakers • Contactors • Motors • Actuators and Hoists • Electronic Tubes • Magamps • Micarta®.

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Wind Tunnels • Airport Lighting • Industrial Plant Apparatus.

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- ☐ Airborne Power for Tomorrow's Aircraft **B-6392**
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- ☐ Aircraft Electrical Systems
- ☐ Aircraft Motors
- ☐ Airborne Radar
- ☐ Automatic Pilots
- ☐ Armament Systems
- ☐ Other.....

Name.....Title.....

Company.....

Street.....

City.....State.....

(Continued from page 46)

tinguish between fore-and-aft push-pull for elevator control and the rudder control, when one-hand operation is used. A push or pull coupled with pistol-grip twist in the direction of turn gives rudder movement, while push alone, resisting the tendency to twist gives elevator movement, Martin explains.

Control system has a linkage to double the pilot's wrist-twist mechanical advantage by exaggerating the pistol grip twist for rudder control movement. Martin says that experiments show adults can exert wrist twist torques up to 160 lb.-in., while a value of 100 lb.-in. is more than enough for one-hand control of the Mighty Midget during all normal maneuvers.

▶ **Armament Schemes**—The plane's design useful load permits basic armament arrangement to be either two 15-mm., 20-mm., or 27-mm. T-type cannon, plus 300 rounds for each installation, or six .30-cal. machine guns and 3,600 rounds.

The machine gun installation may be forward firing (three per wing) or a combination of forward firing (one per wing) plus athwart guns (two per wing) for sidewise firing.

The athwart gun, angled slightly above wing, comes in handy for the pilot to avoid time-consuming maneuvers. Thus, targets which at the instant of detection lie close to the flight path cannot be engaged because that area usually is inaccessible to the plane's armament, Martin explains. Hence, to destroy the target, pilot must first perform certain manuevers, which may not only be time-consuming, but may be responsible for losing visual contact. The side-firing athwart gun gives pilot a weapon to use when he spots a target close to the flight path.

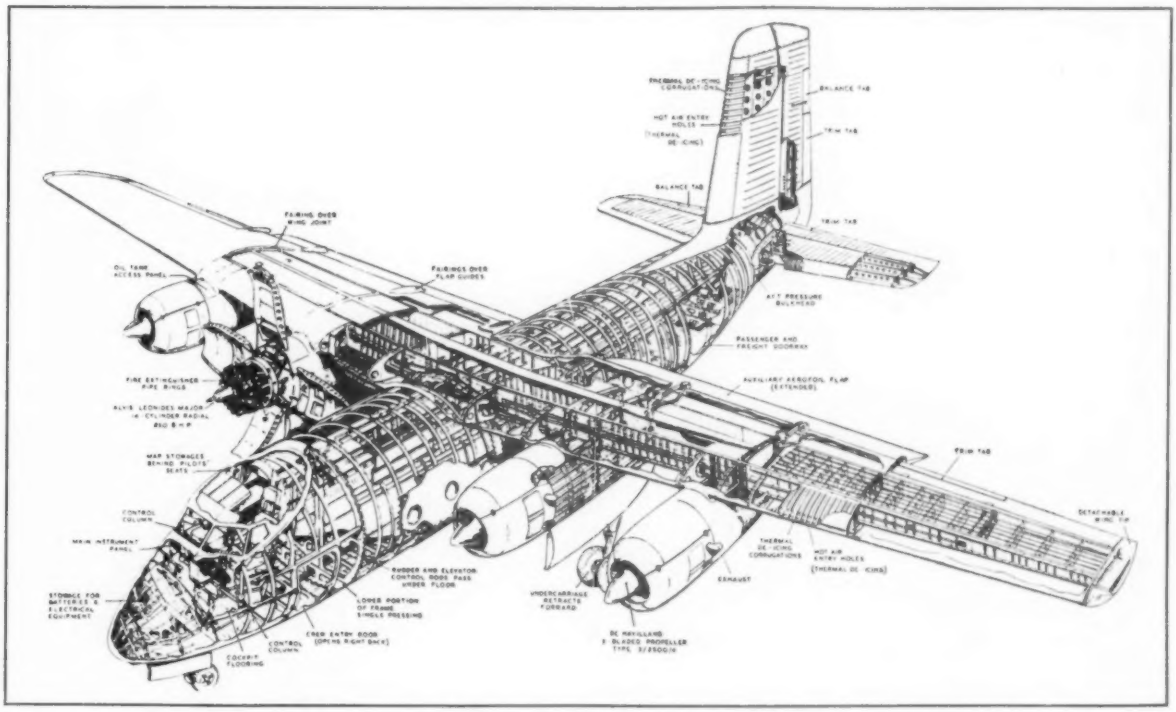
When the basic weapons are removed, the plane could tote an equivalent weight in bombs or rockets. Under this arrangement, eight 5-in. high-velocity aircraft rockets or four 2.75-in. folding fin rocket clusters containing 19 rockets per cluster could be used.

▶ **Prepared Field Loads**—In addition to basic armament, external stores up to 2,000 lb. can be carried when operating from prepared fields with adequately long runways for takeoffs with maximum alternate loads. Alternate loads in addition to basic armament cover two 1,000-lb. or four 500-lb. or four 250-lb. general-purpose bombs; two 1,000-lb. armor-piercing bombs; four 500-lb. fragmentation bombs; two 500-lb. smoke bombs; or two 150-gal. or two 135-lb. napalm bombs.

▶ **Engine Plan**—Martin specified twin jet powerplants for the Mighty Midget, because two engines operating at maximum power would easily provide the high takeoff thrust required for short fields; also because fuel consumption could be cut by using only one engine during cruise. Twin engines would also give the pilot the chance to get back if one were battle-damaged.

▶ **Maneuverability Factors**—The plane's low wing loading and high design load factor (craft has 12G airframe with 1½ factor of safety, bringing ultimate load factor equal to 18G) allows short radius of turn and pull-up over the entire speed range. Turning radius is between 580 and 600 ft. in maneuvers under combat conditions at speeds from about 345 mph. down to about 175 mph.

Benefits of shorter pull-up are explained by Martin this way: Experience and theory show that accuracy of aerial gunfire is directly proportional to line-of-sight distance between aircraft and target. Data at the time the Midget design was worked out reveal that 50% of the rounds fired by average pilots fall within an impact area with a radius



Inside Details of New British Medium-Range Airliner

Engineering cutaway of Handley Page's new Herald medium-range transport shows conventional design and makeup. A production line now is being set up, and the prototype is expected to fly next year. Designed to gross 34,000 lb., the Herald will seat 36-44 passengers and cruise at 200 mph. at 50% Meto power. Wing span is 95 ft., length 70 ft. 3 in., height 22 ft. 6 in. Cabin will be pressurized with maximum differential of 3.35 lb./sq. ft. The Herald (originally called the H.P.R. 3), one of many proposed DC-3 replacements, has been ordered by Queensland Airlines, Australia. Delivery is expected in 1957.

equal to 2% of aircraft-to-target distance.

In a head-on attack, minimum distance at which a pilot may engage a target is a function of the craft's pull-up radius. Hence, when flying a plane with shorter pull-up radius, fire is able to be delivered at shorter range.

▶ **Interchangeability** – Production-maintenance-logistics considerations stress interchangeability. The same part is used for rudder and left and right ailerons. Flaps are interchangeable, and left and right elevators may be substituted for each other.

Small size of the plane's major subassemblies eases transportation problems.

THRUST & DRAG

"Maybe I'm a pessimist," said the engineer, "but the more I work in guided missiles the more I'm convinced that the way we're doing things is all wrong.

"We got missiles coming out the kazoo—one of everything and two of some of them. We got big missiles, small missiles, simple missiles, complicated missiles, red missiles and white missiles, but we haven't got the most important missile."

"And that is . . .," I said.

"A reliable missile," he said.

"What do you propose?" I asked.

"Well, I'd take all the projects that haven't done much—and God knows there must be dozens—and I'd give 'em all sets of drawings of the V-2. I'd tell all of 'em to build V-2's and fire them until they got to the point where they were as reliable as the German operations in the field. Then I'd freeze the design, and have the cheapest producer grind them out for a while.

"I'd ship these out to the Army Field Forces and let them fire to their heart's content until they knew how to handle missiles in the field. They'd take them on maneuvers, let 'em stand out in the sun and rain and fog, tow 'em down hills and across the open fields. Then after about a year they'd have some idea of how to operate in the field with missiles.

"And then I'd take some guys out of those units and send 'em around to help write the military requirements and to advise the project engineers and stand by during the development programs.

"That way, we'd at least have a 200-mi. tactical missile of reasonable accuracy and it would be reliable and the boys would know what to do with it instead of standing around with their thumbs in their ears and being amazed by the latest in scientific toys."

* * *

Two Convair engineers went to Seattle recently on one of the many "exchange" visits which while away the time between designing airplanes. They had problems in common with their brothers-in-arms at Boeing, and discussed them long into the afternoon.

Came time to head back into Seattle and the hotel; one of the Boeing engineers offered to arrange transportation in the regular company shuttle bus. That vehicle was jammed to the door, but there was another Boeing bus right behind, also going uptown. This they got on; but the bus ended its run at the Red Cross blood bank.

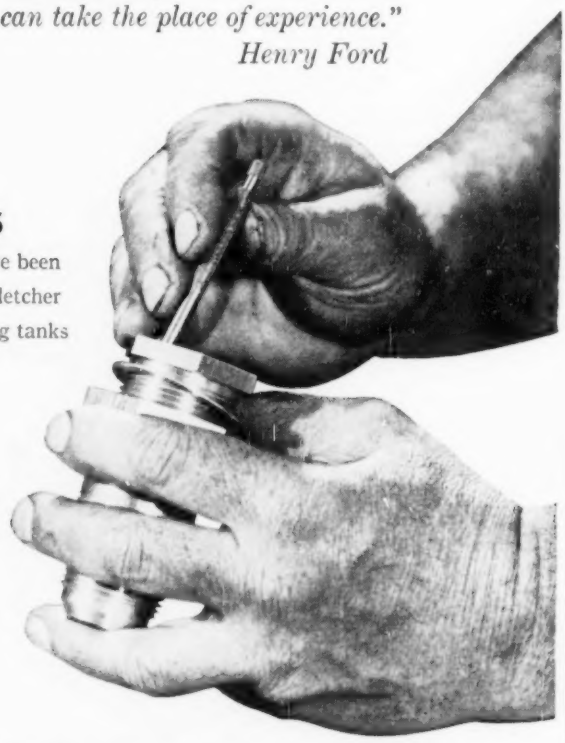
Now the Boeing engineer is having a tough time convincing his Convair cronies that the whole thing wasn't planned, and that Boeing really doesn't demand blood in payment for technical information.

* * *

When we ran those pictures of "Push-over" a few months back (AVIATION WEEK June 21, p. 35), we failed to comment on the photographer, Cdr. Fred W. Maxwell, Jr., of USNARTS, Lake Denmark, N. J. Cdr. Maxwell photographed the loaded V-2 while it was being toppled, providing the only motion picture record of the proceedings that has been released.

Those pictures, plus Maxwell's com-

"No machine yet invented can take the place of experience."
Henry Ford



5,338,195
man-hours have been expended by Fletcher in building wing tanks –since 1947.

No asset of Fletcher Aviation Corporation is as valuable to the buyer as the experienced engineering and producing personnel schooled for millions of hours through crisis and emergency over the critical years.

FLETCHER BUILDS GOOD TANKS

FLETCHER aviation corporation
World's largest designers and manufacturers of external wing tanks
Fletcher Airport • Rosemead, California
Service Offices: Dayton, Ohio • Washington, D.C.
Offshore Affiliates: Oslo, Norway • Tokyo, Japan

ABOVE

Idler and side pinion blanks are cut from alloy steel rounds in automatic bar machines. Teeth are then machined in the blanks, and the pieces are carburized, hardened, and finish ground.

BELOW

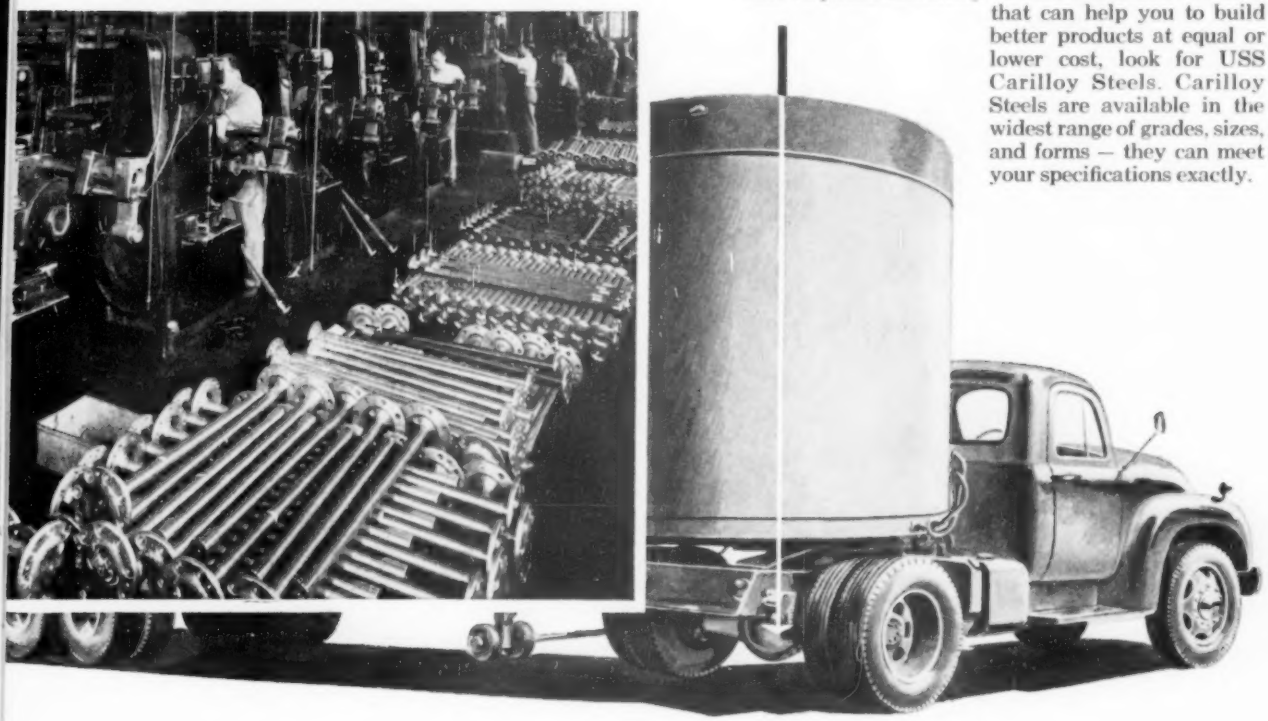
After heat treatment, hardening, straightening, and grinding, axle shafts come to this machining line to be turned, spot faced and hobbed. These axles must withstand hard service in tractor-trailers, farm trucks, and dump trucks.

USS Carilloy Steel used in axles of heavy-duty trucks

A big cross-country tractor-trailer rig needs a high speed axle on the open road. But this same rig needs a *low* speed axle with tremendous pulling power for grinding up steep mountains and inching through city traffic. Eaton Manufacturing Company's 2-Speed axles solve both problems: they provide one gear ratio for heavy pulling power, another for high speed operation.

At any speed, the critical parts in these axles, such as shafts, gears, pinions, and spiders, must withstand severe punishment. Only high quality alloy steels can supply the needed strength and durability, and that's why Eaton uses USS Carilloy Steels.

Wherever you need steel of great strength or toughness . . . steel that enables you to increase durability and decrease weight of heavily stressed parts . . . steel that responds uniformly to heat treatment . . . steel that can help you to build better products at equal or lower cost, look for USS Carilloy Steels. Carilloy Steels are available in the widest range of grades, sizes, and forms — they can meet your specifications exactly.



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UNITED STATES STEEL

and then we built

. . . a propeller pitch control transmission assembly for Beech Aircraft Corporation.

In order for the hydraulic motor to function properly, the tolerances on practically all of the dimensions had to be held to within .0001″ or .0002″ for squareness, parallelism and concentricity.

INDIANA GEAR

INDIANA GEAR WORKS, INC. · INDIANAPOLIS, INDIANA

ments on "Pushover" and "Sandy" highlighted a New York section meeting of the American Rocket Society.

* * *

Reasoning, which on occasion seems to have become a lost art in the world around us, is the basis of any scientific approach. It is also the basis for a number of learned books, which wander off into fields grown deep with verbiage and crossed by tangled paths with countless approaches.

But now, praise be, someone has cut a clean swath straight across the acreage and has produced a little pamphlet called "Methods of Reasoning." This should do the job, once and for all.

In about 16 pages, P. D. Scott—who is an engineer with Ohio Bell Telephone Co.—has condensed the basic scientific approach into language that can be understood even by company executives. The pamphlet is published by the Cleveland Engineering Society, now in its Diamond Jubilee Anniversary Year, and you can get it from them for one dollar. Address: 2136 East 19th St., Cleveland 15, Ohio.—DAA

USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

The following contract awards were recently announced by Wilkins Air Force Depot, Shelby, Ohio.

Instruments Corp., 4 North Central Ave., Baltimore 2, stereoplotter, 2 ea., engineering data, maintenance data, $28,898.

James Mfg. Co., Ft. Atkinson, Wis., laboratory darkroom, spare parts, $778,147.

Hugh Johnson Associates, Inc., 821 19th St., N. W., Washington 6, D. C., editing and collating of maintenance manuals, $202,923.

Johnston Foil Mfg. Co., 6106 S. Broadway, St. Louis, Mo., chaff, 19,480 cartons, 14,000 cartons, $1,931,424.

Kollsman Instrument Corp., Standard Coil Corp., 80-08 5th Ave., Elmhurst, N. Y., true airspeed computer and transmitter, 359 ea., $241,211.

Lear Inc., 110 Ionia Ave., N. W., Grand Rapids, Mich., switch, engaging type, 419 ea., $28,860; actuators, 10 ea., element, 3,027 ea., actuator, 6 ea., $65,189.

Sperry Gyroscope Co., Sperry Corp., Great Neck, L. I., N. Y., indicators, data, $314,-127.

Thompson Products, Inc., Cleveland, machinery and equipment for production of jet engines, $240,000.

Transomatic Corp. of America, Rte. 12, Flemington, N. J., bracket; gun trunnion, 9,952 ea., $30,751.

Tumpane Co., Government Aircraft Plant No. 6, Marietta, Ga., machine tool processing and plant maintenance service, $300,-000.

John M. Wall, Inc., 107 N. Franklin St., Syracuse 2, N. Y., camera set, 12 ea., $130,359.

Wells-Gardner Co., 2701 N. Kildare Ave., Chicago 39, radio receiver, 30 ea., radio modulator, 21 ea., dynamotor, 21 ea., $100,514.

Wilding Picture Production, Inc., 1345 Argyle St., Chicago, produce motion picture, 1 ea., release prints of motion picture, 1 ea., specification changes, 50 ea., $70,000.

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J., facilities for overhaul program, $63,323; aircraft engine, spare parts, $617,193; spare parts for engines, $390,000; special tools, $82,000.

American Air Filter Co., Herman Nelson Div., 1824 Third Ave., Moline, Ill., heater, engine and shelter, portable, ground, gasoline-burning, 400,000 Btu. per hr., 117 ea.; based on RFP 33-602-54-3090; $191,787.

Flexible Tubing Corp., Guilford, Conn., hose, air duct size "A," 5,252 ea., hose, air duct size "B," 15,756 ea., adapter plate 12 to 6", 5,252 ea.; based on RFP 33-602-54-3051, $284,868.

Ronan & Kunzl Inc., Marshall, Mich., tank, liquid oxygen storage, 8 ea., 8 ea., spare parts, $121,083.

Welded Construction Engrg. Co., 2037 W. 14th St., Cleveland 13, trucks, aircraft, fuselage trans. and mating aft. section; based on RFP 33-602-53-3281; $379,608.

ARDC Contracts

The following contracts have been announced recently by Headquarters, Air Research and Development Command, Baltimore 3, Md.

CALIFORNIA INSTITUTE OF TECHNOLOGY, Pasadena, Calif., a research program on analytical investigation of secondary flow in windtunnel axial compressor stages, (P. R. 226545), $29,180.

TEACHERS COLLEGE, New York 27, N. Y., evaluation of a technique for characterization of selected Air Force jobs based on attributes of those jobs, $25,935.

PSYCHOLOGICAL SERVICES, INC., 909 W. Jefferson Blvd., Los Angeles 7, development of a method for systematic determination of training procedures in trouble-shooting K-systems equipment, (P. R. 346983), $26,689.

UNIVERSITY of CALIFORNIA, Berkeley 4, Calif., additional research on "Methods for Assessing Air Force Officers for Command and Staff Leadership" (P.R. 346993), $46,000.

Sub-Killer Aloft

The newest addition to the Navy's anti-submarine fleet, the Goodyear XZS2G-1, is shown in its first flight over Akron Municipal Airport (Aviation Week, Aug 2, p. 7). Boasting speed in excess of all previous K types, the new airship demonstrates the inverted-Y configuration of three stabilizers and control surfaces on its stern. Flight controls are subject to manual or automatic pilot operation.

PLATINUM ALLOY
potentiometer windings give
LONGER LIFE and greater

in the new *Pacific*
RATE GYRO

Precious metal potentiometer windings, of special platinum alloy, plus Pacific Scientific's advanced production techniques make possible unequaled quality at prices competitive with ordinary designs. Precision potentiometer, new motor and wheel design give maximum dynamic range and exceptionally high natural frequency. Powerful signal suitable for either ac or dc intelligence systems. Maximum output up to ±50 volts.

The simple, rugged design of the new Pacific Rate Gyro makes it ideal for checking flight test characteristics, telemetering systems, automatic pilot and guided missile control. Check these specifications against your design problems:

MOTOR POWER—115 volt, 400 cps. or 28 volt d.c., Approx. 10 watts.

RANGE—Any range from ± 10°/sec. to ± 1000°/sec.

NATURAL FREQUENCY—From 3 cps. to 200 cps., depending upon rate range. Example: ± 50°/sec. unit, Natural Frequency—above 25 cps.

DAMPING—Viscous fluid damper, normally 0.5 to 0.7 of critical damping.

POTENTIOMETER RESISTANCE—From 500 ohms to 20,000 ohms, with or without taps, single or dual pots available.

RESOLUTION—0.25% to 0.8% of total potentiometer resistance.

ACCURACY—Within 1.0% to 2.5% of full rate depending upon range of instrument.

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'Pilot' Takes Orders From Arms System

• Design philosophy behind Minneapolis - Honeywell's E-10 auto flight control: Tailor system to the plane.

By Philip Klass

Minneapolis—In the new E-10 automatic flight control system, Minneapolis-Honeywell's Aeronautical Division has put the design emphasis on a system capable of maneuvering a plane along a flight path prescribed by interceptor fire control or a bombing computer, rather than attitude and heading stabilization as in older autopilots.

The term "automatic flight control" (replacing the familiar "autopilot") reflects the E-10's operational role and increased capabilities, which include such features as all-attitude maneuverability, control-stick steering, and constant Mach number climb and cruise control.

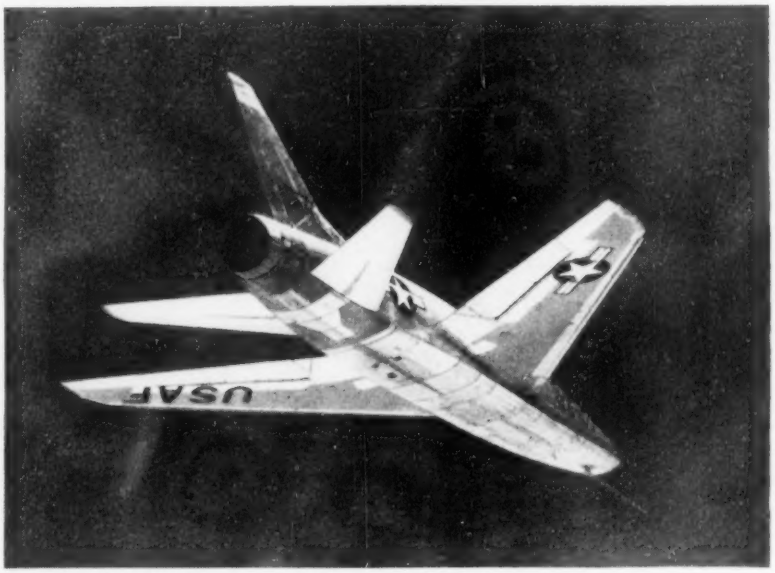
Developed under the sponsorship of the Wright Air Development Center, the E-10 will see its first operational use in a late model of the F-100.

▶ **Versatile Building Blocks**—Actually the E-10 is a group of versatile building blocks which M-H believes can be engineered quickly into a system capable of handling almost any of the new high-speed fighters, interceptors, bombers or transports.

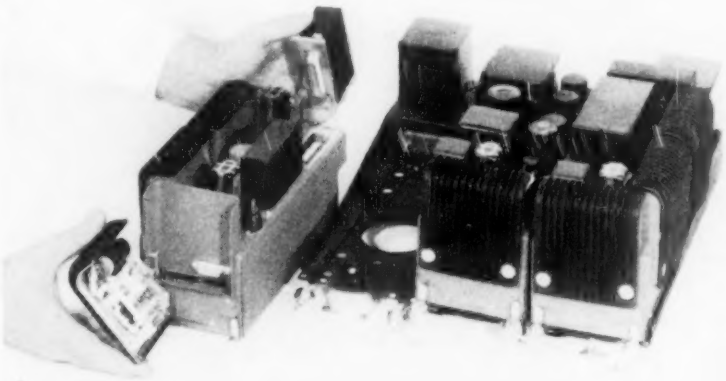
Behind this philosophy is the recognition that autoflight controls must now be tailored to individual airplane configuration and aerodynamics, but that there is never enough time to start from scratch for each new airplane.

▶ **Light in Weight**—In the fighter-interceptor version, the E-10 weighs in at around 65 lb., uninstalled. The new system weighs only one-third as much as the Honeywell C-1 autopilot used on B-29s during World War II, yet offers many more operational features. (Weight figure does not include a directional gyro. The E-10 uses signals provided by the Kearfott-developed N-1 high-latitude, low-drift, panel-indicating gyro which is standard on many USAF aircraft.)

M-H has not switched to magnetic amplifiers as have some other autopilot manufacturers. The reason, according to Ben Ciscel, E-10 project engineer is their added weight and the temperature limitations imposed by rectifiers used with mag amplifiers. The E-10 is designed for operation in 200F ambients, (a figure which M-H hopes to raise to 225F) reflecting the high temperatures found in highspeed jets.



FIRST OPERATIONAL USE of E-10 automatic flight control system will be on a late model of North American Aviation's supersonic F-100 Super Sabre fighter.



E-10'S NERVE CENTER is amplifier-calibrator whose design stresses easy maintenance.

▶ **Operational Features**—Some of the E-10's operational features, appearing for the first time in M-H equipments, confirm certain design trends which first appeared in the Westinghouse W-3A autopilot, designed for the F-94C interceptor. Others are believed new to the industry. Here are some of the E-10's operational highlights:

• **All-attitude maneuverability:** Although rate gyros have been used in one or more axes of previous M-H autopilots to provide rate-of-displacement signals, the E-10 uses the non-tumbling devices as a primary reference. This gives it unlimited maneuverability about all three axes, an important feature for fighters and interceptors. For the pitch axis, the rate gyro signal is integrated to provide also a pseudo displacement signal.

• **Built-in dampers:** The E-10 provides stability augmentation for one, two, or three axes, as required. The yaw axis system provides damping in straight

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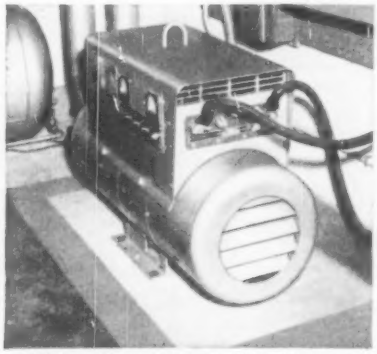
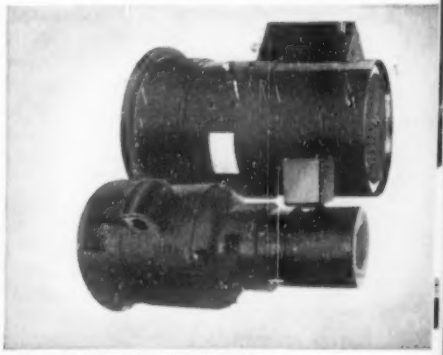


MOTOR DRIVEN UNITS, like this one in a jet engine test power room, are available in 265-, 500- or 1000-amp, 28-volt ratings. Suitable for mobile use or stationary installations, these units give you accurate and more reliable ground power.



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flight and turns, yet does not oppose initiation of turns (as did some earlier dampers).

• **Control stick maneuvering:** Pilot maneuvers, under manual or autoflight control, are introduced in the same way using the regular control stick (or column) and rudder pedals. This eliminates the long-used miniature-stick or knob controller, always a problem to locate on the crowded pedestal.

• **Constant Mach No. climb:** For optimum fuel economy during an airplane's climb to cruising altitude, the E-10 can establish a rate of climb which keeps the plane at a constant Mach number speed.

• **Choice of actuators:** M-H has designed both parallel and differential types of electrically controlled hydraulic servo actuators for the E-10. The former, which can be used as the main control surface actuator, is a high power unit connected in parallel with the plane's control linkage. The latter, a lower power device connected in series with the control linkage, actuates the plane's boost valve which in turn operates the boost actuator driving the control surface. The choice of actuator type depends upon the individual airplane installation. The F-100 will use both types.

▶ **Ties With the Past**—M-H has not made a complete break from past autopilot design philosophies and practices.

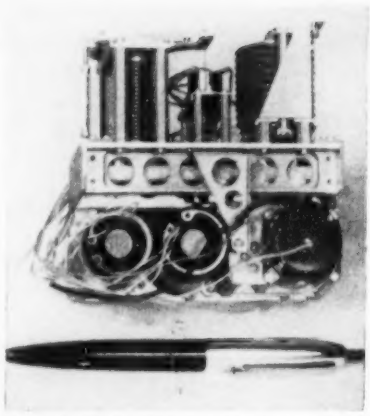
For instance, the E-10 uses a d.c. signal system and potentiometer pickoffs instead of a.c. and synchros used by many others. The reason, according to Ciscel, is that a d.c. system permits multiple signals to be added without phasing problems and allows the use of small, lightweight filters for rate derivation and integration, instead of requiring small integrating motors and tachs.

▶ **No Feet**—The pilot's feet get a break in an E-10 equipped airplane. As soon as the pilot banks the plane, the yaw channel automatically deflects the rudder, proportional to aileron deflection, role rate, and changes in yaw rate, to provide a coordinated turn. An accelerometer, sensitive to sideslip forces, provides signals to maintain coordination during the turn. Thus the airplane becomes essentially a two-control aircraft.

The pilot can overpower the system to introduce intentional sideslip merely by applying pressure to his rudder pedals. This causes a pedal-force transducer to generate a signal which introduces the desired sideslip.

▶ **Three Pitch Axis Modes**—In pitch axis control, the E-10 provides the pilot with a choice of three modes of operation:

• **Constant Mach number,** for economical climb and cruise. When engaged, this control reportedly maintains existing speed within .02 Mach.



E-10 CONTROLLER maintains engaged altitude within 50 ft. above 10,000 ft.

DOUBLE-DUTY STICK is used for both autoflight and manual control maneuvers.

• **Constant altitude,** for cruise. M-H says system maintains engaged altitude within 10 feet below 10,000, within 50 feet above this altitude.

• **Unlimited maneuvering,** by human pilot or when tied into interceptor fire control.

Although the E-10 carries a conventional attitude gyro for roll-axis use, M-H prefers to use a pseudo displacement signal (integrated rate signal) for pitch attitude control. The reason: It permits unlimited pitch maneuvering and simplifies synchronization problems. Another advantage is that a pseudo lagged-rate pitch signal eliminates the long-term phugoid oscillation frequently encountered in the highspeed aircraft which use displacement gyros for pitch attitude reference, M-H says.

If the E-10 is in the maneuvering mode when engaged, it maintains the existing pitch attitude, with a drift of approximately 0.2 deg./min., M-H reports. If the plane's bank angle at the time of engagement is more than five degrees, the E-10 maintains the existing rate of turn; if less than five degrees, it levels out and holds heading.

▶ **"Easy Joe" Maneuvering**—Control stick maneuvering, which M-H pioneered five years ago under the nickname of "Easy Joe," may see its first operational use on the F-100, although other autopilot manufacturers (including Lear and General Electric) are planning to incorporate it in their new systems.

M-H says it considered six different types of control stick maneuvering before settling on its present approach in which airplane pitch and roll rate are proportional to the force which the pilot applies to his control stick. This force deflects a strain element built into the top portion of the stick (which M-H supplies) which operates a pot to generate a maneuvering signal.

With the system selected, control stick force gradients can be made identical to those experienced in normal flight so the plane "feels" the same to the pilot whether maneuvered under manual or autoflight control. To carry this even further, M-H incorporates a motor-driven integrator (which doubles as a roll-axis synchronizer before engagement) that serves to hold the plane in a bank when the pilot takes his hands off the control stick, as under manual flight conditions.

▶ **A Look at Major Components**—Some of the principal E-10 components with novel design and construction features, include:

• **Amplifier-calibrator** is E-10 nerve center. It contains the three main servo amplifiers plus four synchronizing and remoting amplifiers, is designed for speedy maintenance and optimum heat dissipation.

Each of the seven amplifiers is built on a small plug-in aluminum shell with heat radiating fins. These amplifiers are clustered around three larger plug-in chassis (one for each axis) which are in turn quickly removable from the main amplifier-calibrator chassis containing power supply and associated control relays. The seven amplifiers are identical and interchangeable. Where different amplifier gains are required, they are achieved by using different values of feedback resistors located in the main chassis plug.

• **Parallel-type servo actuator,** together with the polarized torque motor control valve (which controls flow to the actuator piston in accordance with servo amplifier signals), is built into a single integrated package which also contains several associated control and protective devices. For instance, the package contains a solenoid-operated engaging valve which automatically disengages the autopilot in the event of failure of hydraulic or electric power, giving the

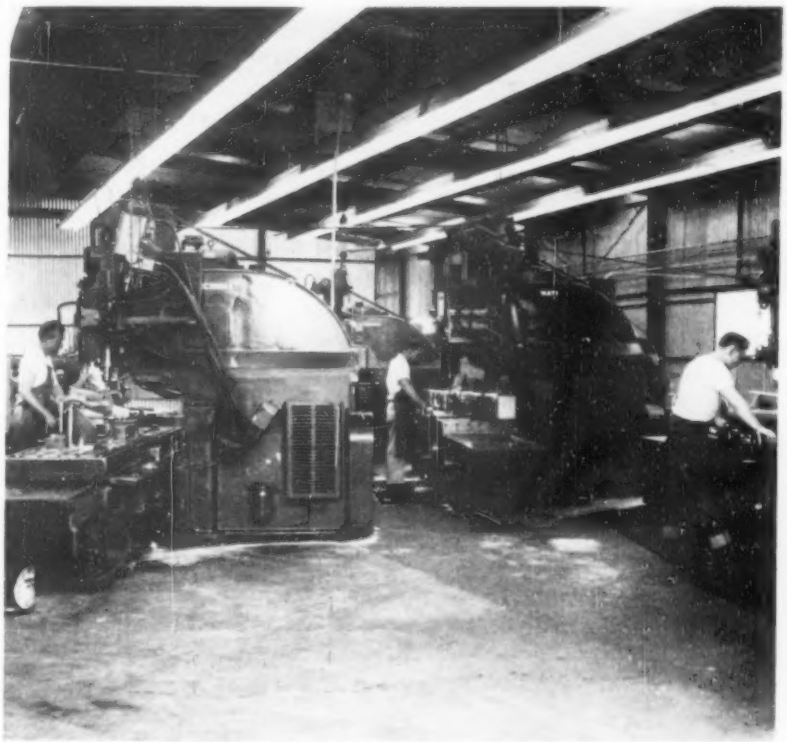
Loud Grows to Serve Industry Better

• Loud meets the increased aircraft demands for quality and economy with expanded facilities and equipment.

▸ **History** – From a small repair shop started in 1908 Loud has grown into one of the most completely equipped job machine shops in Southern California. This modern plant, including engineering and test laboratories, occupies almost two hundred thousand square feet and employs approximately seven hundred persons.

▸ **Facilities** – Within this modern completely equipped plant fabrication of the smallest precision valves to the largest aircraft structural fitting is accomplished. Loud is one of the very few plants equipped to handle all phases of manufacture from raw material to finished product in one plant. One of the largest milling departments in the West contains forty large mills, over 10 of which are of the Hydrotel automatic duplicating type. Other unusual equipment includes flash welders – one an 800 KVA giant capable of up to 12 square inches of chrome moly up to 10 inches in diameter; complete heat treating facilities including a 10 foot deep vertical atmospheric controlled furnace (necessary for the production of highly stressed arresting hooks); automatic duplicating lathes, automatic chucking lathes, qualified spot welding machines, complete qualified plating facilities including hard chrome, anodizing, cadmium, silver, copper, and dichromate (for magnesium); all types of grinding and honing machines, and the finest of inspection tools such as comparators and surface analyzers.

In addition to this unusual equipment the plant contains a multitude of turret lathes, hand screw machines, automatic screw machines, engine lathes, drill presses – some automatic indexing, large radial drills, boring machines, shapers, and planers. Complete qualified facilities for arc, oxy-acetylene, and heli-arc welding of steel and aluminum are provided.



ONE OF THE LARGEST milling departments in the West contains forty large mills, over 10 of which are of the Hydrotel automatic duplicating type.

These facilities make Loud an outstanding source for major sub-assemblies of aircraft.

With this complete manufacturing facility in one plant Loud can produce major structural sub-assemblies. An assembly line for the production of tactical ground handling equipment is currently turning out jet engine cradles in large quantities.

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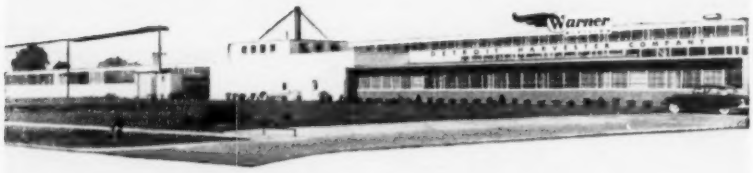

Warner Doubles Plant Facilities
Steps-up Precision Subcontracting Work

THE Warner Division of Detroit Harvester Company has moved into a new and larger manufacturing plant.

In addition to permitting an increase in the production of hydraulic units of their own design, such as pumps, valves and actuators, this expansion places Warner in a position to take on additional precision subcontracting work for aircraft and ordnance plants.

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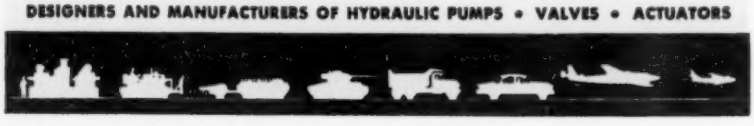

actuator freedom of motion.

The hydraulic package also contains a small trim actuator which functions to prevent autopilot engagement if there is a large unbalance in the control valve which would produce a sharp transient movement of the control surface actuator. The same device also operates switches to actuate the plane's trim or tab servo motor (if so equipped), continuously keeping the airplane in trim. Relief valves, whose pop-open settings can be adjusted, are provided to limit maximum output forces of the main actuator piston and permit the human pilot to overpower the actuator in an emergency.

The torque-motor control valve employs a twin-piston, balanced teeter-type construction. In its internal hydraulic porting to the main actuator piston it functions as a metering valve instead of employing the more conventional symmetrical design which is more difficult to machine and assemble.

The parallel-servo package weighs approximately 5 lb., operates at hydraulic pressures of 1,500 to 3,000 psi. over a temperature range of −65F to 200F. Frequency response of the unit is around 10 cps. for a 90-deg. phase lag, depending upon load and operating conditions, M-H reports.

• **Differential-type servo actuator** consists of a smaller, lower-power control valve and actuator. There are no engaging or overpower valves, or trim actuator since they are not required in a differential-type rigging. However, the differential servo does incorporate provisions for automatically locking the actuator piston, and centering it if desired, when hydraulic power is removed. The unit weights approximately 3 lb., has a 90-deg. phase lag at 40 cps., M-H says.

• **Altitude and Mach sensors** employ bellows elements which are continuously balanced by a small servo motor for maximum sensitivity. The motor drives a pot and tach generator to provide both displacement and rate-of-change signals. M-H says the altitude sensor can detect a one-foot change in altitude at sea level; its Mach sensor can detect a change of 0.001 Mach number over its operating range.

The vertical non-tumbling gyro and rate gyros used in the E-10 were announced and described previously in AVIATION WEEK (Feb. 2, 1953, p. 50; Feb. 1, 1954, p. 48). M-H's policy is to market individual new components, such as gyros, developed for its automatic control systems.

The E-10, like other recent autoflight control systems, can be provided with an automatic gain changer to vary system characteristics as a function of airplane speed, and with safety monitors or G-limiters.

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1941	2½°	5 oz.	$20.00
1944	20′	5 oz.	$35.00
1954	10′	1¾oz.	$25.00
Coming	5′	5 oz.	?
Coming	15′	1¼oz.	?

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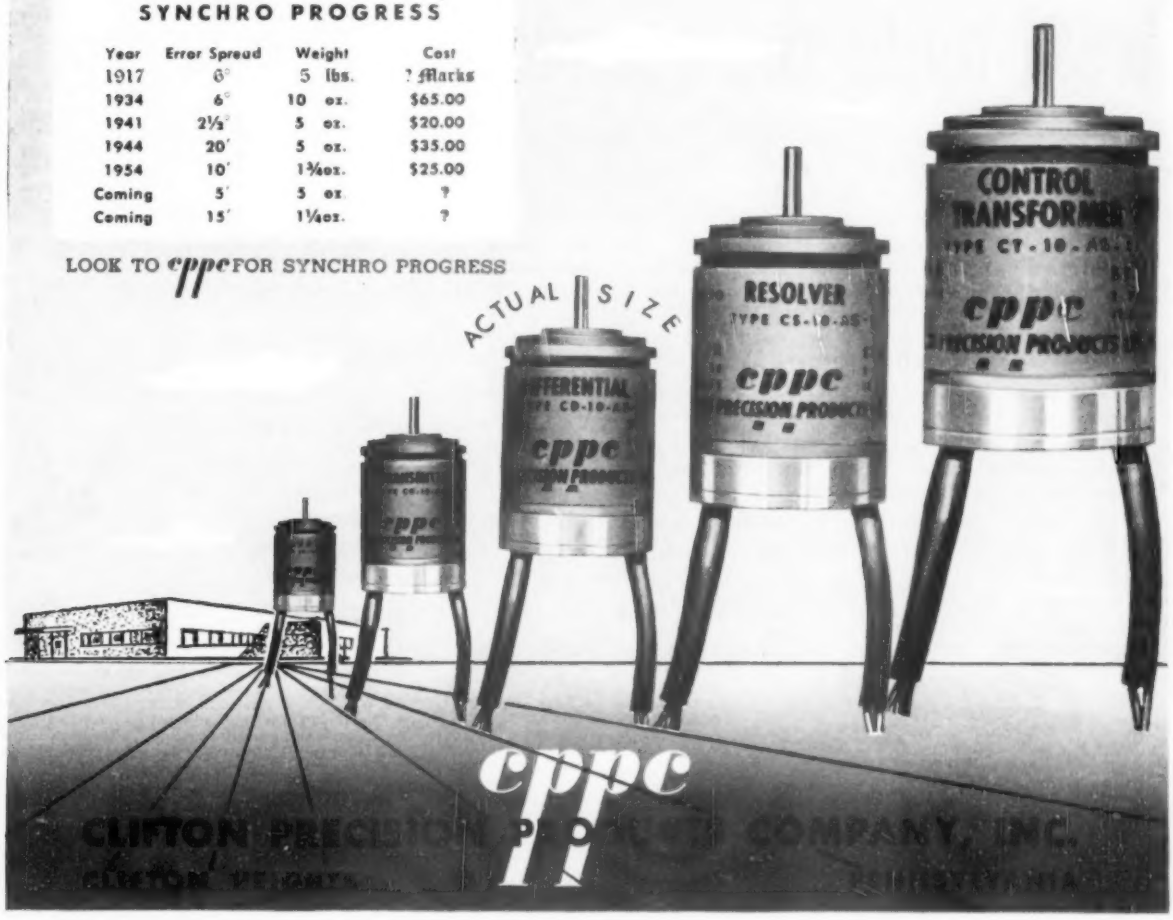

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FILTER CENTER

▶ **RCA Shows New Radar**—First public showing of RCA's new AVQ-10 storm-warning radar was made in Los Angeles during recent SAE meeting. Company spokesman says TWA is getting AVQ-10s for evaluation, and that Braniff, National, PanAm, and TWA and several foreign airlines have requested sets for evaluation. TWA's 20 new Super Connies will have all necessary provisions for adding radar when airline decides to buy.

▶ **Collins Dickering on Radar**—Collins Radio has announced plans to enter the airborne storm-warning radar field (AVIATION WEEK Sept. 20 p. 68) and is negotiating with a major airline to evaluate an engineering model early next year.

▶ **Better Solar Battery**—Bell Telephone Labs has increased the efficiency of its experimental solar battery to 8%, which is 33% better than earlier models. This is 10-15 times the efficiency of familiar photo cells. The improved solar cells can develop 80 watts per square yard of surface when exposed to full sunlight. Individual cells develop approximately 0.5 volt, but can be connected in series to give any required voltage. Increased efficiency comes from new gaseous diffusion process which enables arsenic-doped silicon crystal to be coated with a layer of boron only 0.1 mil thick.

—PK

New Avionic Bulletins

New technical bulletins on devices of interest to persons in the avionics field include:

• **SPAR**, super precision approach radar, for use at small airports (6 pp.). Laboratory for Electronics, Inc., 75 Pitts St., Boston 14, Mass.

• **Min and sub-min tube shields**, for clamping and cooling electron tubes (12 pp.). International Electronic Research Corp., 177 W. Magnolia Blvd., Burbank, Calif.

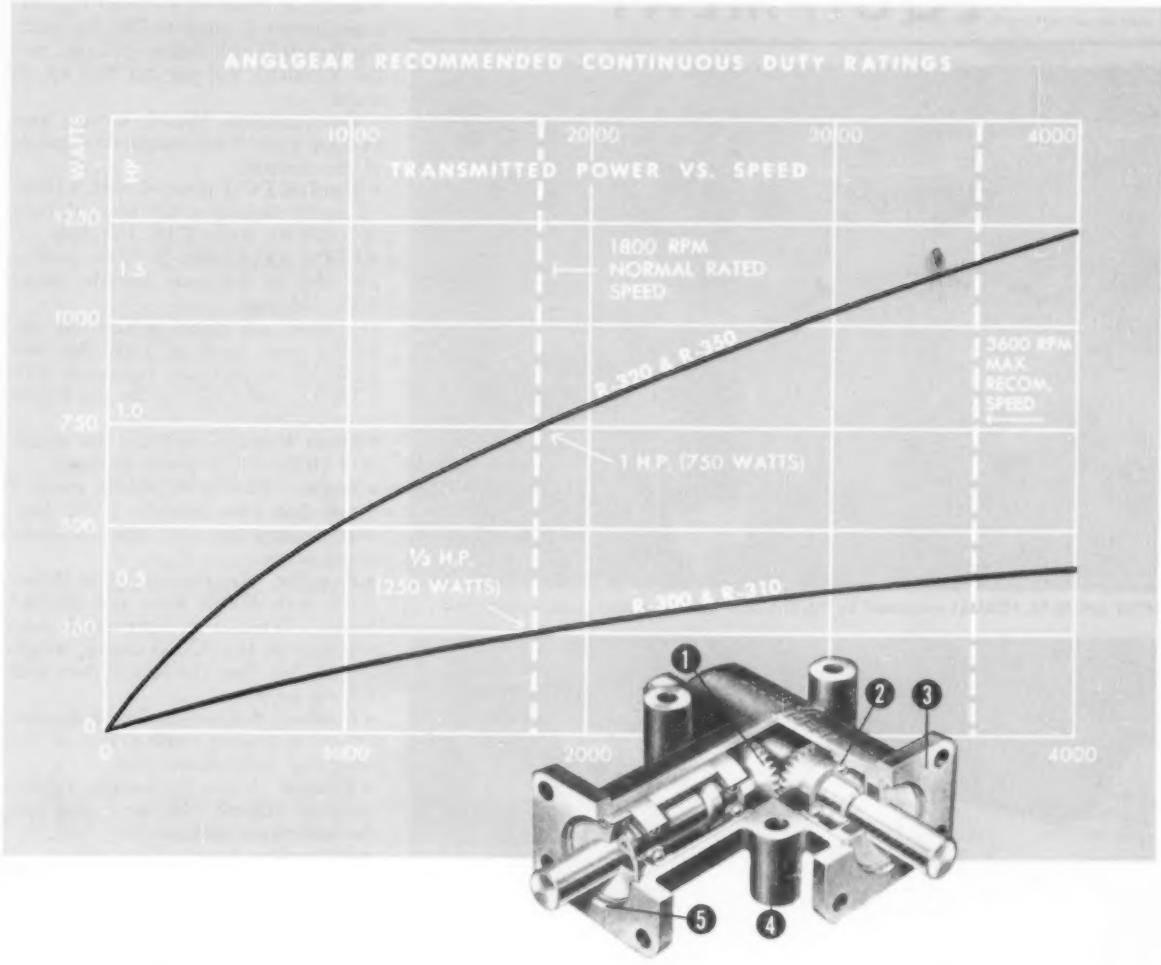
• **Toroidal inductors**, precision wound for low- and high-frequency uses. Bulletin TL2-P4 (4 pp.). Lenkurt Electric Sales Co., 1161 County Road, San Carlos, Calif.

• **Repeat cycle timers**, miniature and hermetically sealed, available with plug-in or terminal base. Bulletin A.W.H. RC200, 2 pages. A. W. Haydon Co., 230 N. Elm St., Waterbury, Conn.

• **Stepping relays**, application engineering data on midget, high speed, vibration-resistant, and interlock types. Bulletin P-84 (12 pp.). Guardian Electric Manuf. Co., 1621 W. Walnut St., Chicago 12, Ill.

• **Hy-Therm sub-min capacitors**, offering high insulation resistance and high temperature stability, designed to meet MIL-C-25A, are described in catalog C-6 available from Hopkins Engineering Co., 2082 Lincoln, Altadena, Calif.

• **Large-screen oscilloscopes**, with 17- and 21-in. tubes, 1% linearity, and calibrated time base (10 micro seconds/in. to 1 sec./in.) are described in 4 page bulletin. Electromec, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.



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R-300x	2 WAY	—	—	500	⅜	½ lb.
R-310	3 WAY	½	1800	400	⅜	½ lb.
R-310x	3 WAY	—	—	500	⅜	½ lb.
R-320	2 WAY	1	1800	1500	⅝	2¼ lb.
R-330	3 WAY	1	1800	1500	⅝	2⅜ lb.

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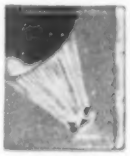

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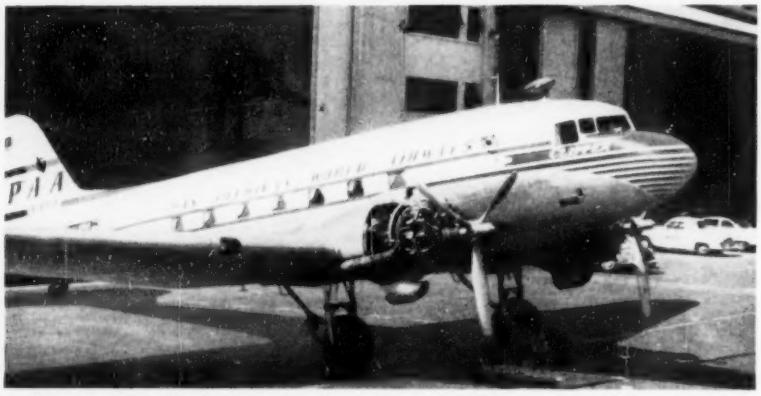

HI-PER DC-3 modification of Douglas transport, which mounts R2000 powerplants.

Airwork-P&WA Forum Hears How . . .

R2000s Give DC-3 34-Mph. Boost

By George L. Christian

Millville, N. J.—A strong pitch for the Hi-Per DC-3—a DC-3 mounting DC-4 engines—was made by Pratt & Whitney Aircraft at the fifth annual Engine Operation and Maintenance Forum sponsored here by Airwork and P&WA. The one-day forum was attended by 118 experts representing 59 companies, U. S. and foreign government agencies, and the military.

▶ **Hi-Per DC-3**—The Hi-Per DC-3 shows a 34-mph. speed edge over the normal DC-3. It is one of several successful methods of souping up the old workhorse. Pioneered by Panagra, with Pratt & Whitney's assistance, it is the method recommended by the engine manufacturer to operators desiring to boost DC-3 performance.

P&WA's opposition to the "Super-92" conversion remains unchanged from that expressed at last year's forum. Super-92 refers to DC-3s whose R1830-92 engine cylinders have been replaced with R1830-75 cylinders. Some believe that because of the better cooling characteristics of the -75 cylinders, more power may be safely pulled on the engine, but P&WA says it cannot go along with this.

Pratt & Whitney spokesmen, addressing themselves to operators of executive DC-3s, said: "Rather than go to the -75 or -95 versions of the R1830, let's look at the R2000." Here is what a fast look shows:

A full 100 hp. more per engine is available at cruise with R2000 engines: cruise power is rated at 750 hp. each; the R1830-75 will deliver 650 hp., and the R1830-92 will put out 600 hp. at cruise

Pan American World Airways and Panagra quote these comparative speeds of the aircraft:

• **Standard DC-3** powered with R1830-92 engine cruising at 600 bhp., altitude of 9,000 ft., cruise TAS: 180 mph.

• **Hi-Per DC-3** with R-2000s pulling 750 bhp. at the same altitude, cruise TAS: 214 mph.

Takeoff and climb powers for the R2000 were listed as 1,450 hp. and 1,250 hp. respectively, compared with 1,200 hp. and 1,050 hp. for the R1830 series engines.

▶ **Power Package**—Here are the details of a Hi-Per DC-3 power package:

• **Engine.** P&WA R2000-D5 rated at 1,450 bph. for takeoff, 1,100 bhp. normal rated and 750 bhp. maximum cruise power.

• **Propeller.** Hamilton Standard Hydromatic with 43D50 hubs and 6863A-1 blades. (This is a lightweight prop which, with the R2000 engine, weighs slightly less than the R1830 does with the old prop.)

• **Cowling.** External cowling is standard DC-3. Accessory cowling is new and fabricated of stainless steel.

• **Exhaust.** A new lightweight, easy-to-maintain exhaust collector is used with the new power package.

• **Oil cooler.** A new 13-in. AiResearch oil cooler is used. Installation includes provisions to eliminate flame propagation through the cooler in case of fire in Engine Zone One.

• **Cowl flaps.** New cowl flaps are provided which reduce maintenance difficulties, provide smoother exit cooling airflow and hold their setting more exactly than standard DC-3 cowl flaps.

• **Air scoop.** Redesigned air scoop provides better ram air recovery and higher critical power altitude for the R2000 engine.

• **Fire detection.** A Zone One fire detector circuit has been added to give protection in that zone in addition to the existing Zone Two detector installation. A fire detector test switch has been included and a second CO_2 bottle added.

The Hi-Per DC-3 has a geared rudder trim tab to lower pedal forces in case of engine failure at takeoff. It has an allowable takeoff and landing weight of 26,900 lb.

P&WA pointed out that the R2000 powerplant is in current production, as are spare parts, and a wealth of operating experience has been accumulated on the engine in DC-4 operation.

At present there are a few DC-3s converted to the Hi-Per configuration. Further information on the installa-

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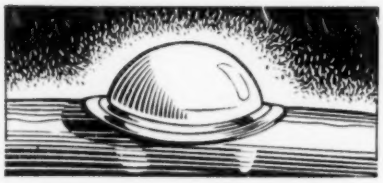

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tion may be obtained from PanAm or Panagra, Miami International Airport, Miami.

▶ **Forum Highlights**—Here is a summary of some of the other highlights of the forum:

• **Master rod bearings.** Some time ago, Northeast Airlines experienced a rash of master rod bearing failures on R1830s installed in its fleet of DC-3s.

Trouble was traced to the fact that the planes' oil tanks had hoppers installed in them. Result was that aerated oil returned from engine to hopper and was immediately directed back to the engine before being sufficiently de-aerated. NEA quickly worked out a fix consisting of removing the hoppers and installing de-aerating baffles in the oil tank. No further failures were reported.

• **Cowl flaps.** P&WA is not in favor of the practice adopted by some airlines who replace movable cowl flaps with fixed gills to simplify the installation and reduce maintenance. P&WA feels that controllable cowl flaps are necessary to keep engine operating temperatures within specified limits.

• **Oil dilution.** P&WA spokesmen had this advice concerning oil dilution: First, always consult a manual which has your particular plane's powerplant configuration listed to determine duration of dilution in relation to expected low temperatures for the period the plane will be idle. If the engine to be diluted has several hundred hours on

Hot Lunch Coming Up

Air Force bomber and patrol crews on extended missions have long been faced with one answer when they get hungry—the box lunch. But now the Nutrition Section of Air Research and Development Command's Aero-Medical Laboratory has worked out a way to use Reynolds heavy aluminum foil-pack containers for individual packaging of the meat, vegetables, rolls, and other makings of the lunch. The aluminum packages are refrigerated until mealtime, then shoved into an electric stove for 30-minute cooking. These hot lunches are said to be cheaper to make up than box lunches.

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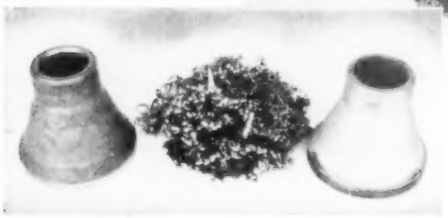

The time and material savings for this one JATO part are illustrated by the "before" (above) and "after" (left) photographs.

The U. S. Navy Bureau of Aeronautics has achieved impressive savings for the government and assured availability of rocket powerplants during emergencies by conducting at Aerojet-General a production engineering program resulting in reduced cost, elimination of strategic materials and facilities, and simplification of manufacturing processes. This program, directed primarily toward the new 15KS-1000 smokeless JATO, has been a significant part of Aerojet-General's effort to maintain high standards of quality and reliability while, at the same time, reducing costs and greatly expanding its production capacity to meet anticipated Department of Defense requirements.

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it, it is wise to check the oil screens after dilution, because dilution tends to loosen sludge which may settle anywhere.

Before takeoff, be sure to boil off all the fuel in the oil. If fuel is left in the oil it will boil off too rapidly when hitting very hot engine parts during takeoff and blow out of the engine's breather.

• **Engine hydraulicking.** A hydraulicked engine is one in which oil has seeped past the rings of the bottom cylinders while the engine is idle and has accumulated sufficiently in the bottom cylinders to force the piston to "bottom" on the oil during the compression stroke. If this happens and the engine is being cranked through with considerable force, damage will usually result.

If hydraulic lock is present and a direct drive starter is installed on the engine, no damage will result in attempting to start the engine because the stall torque value of the starter is too low to turn the engine against the hydraulic lock. This is true even if the starter clutch is stuck.

If an inertia starter is installed on the engine, damage can be done in trying to start a hydraulicked engine. If such a start is attempted, check link rods of the cylinders with a straight edge. If bent, change the engine; if straight, engine is OK, provided cylinder hold-down studs are tight.

A good check for hydraulicking on an R2800 is to turn the engine through about 12-15 blades before starting. This also serves as a good pre-oiling operation.

• **Field barometric check.** To determine whether or not an engine is developing full power, regardless of the field's altitude (assuming that the engine has no BMEP gage or other instrument to show power output), P&W suggests the following procedure: Determine manifold pressure of the engine prior to starting. After engine has warmed up, manifold pressure should steady down at approximately the same reading with the engine turning over at 2,000 rpm. If rpm is 50 less than the 2,000, there probably is trouble and further checks should be made. This check will locate a trouble such as both plugs in one cylinder being out. A magneto check will not locate such a malfunction.

• **Engine baffles.** P&WA stressed the importance of checking the condition of engine baffles to keep engine (and airplane) operating as efficiently as possible. One airline that made a survey of its engine baffles, repairing or replacing damaged units, found that engine cylinder head temperatures skidded 10-15 degrees. This meant that cowl flaps could be closed to half the previous settings, increasing the aircrafts' speed an average of four knots.

• **Oil additives.** P&WA repeated its

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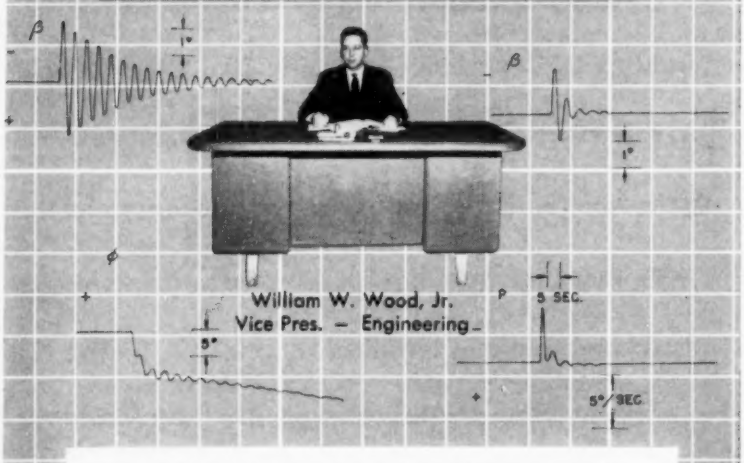
SOME STRAIGHT TALK TO ELECTRONIC ENGINEERS



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objection to use of oil additives to improve engine life, etc. A spokesman said: "Pratt & Whitney engines are designed to operate on mineral oil undiluted by 'moose juice'. . . . We have investigated many 'moose juices' throughout the years and they just don't do what their promoters say they will. . . . P&WA tests all approved oils used in our engines. . . . We cannot approve an oil additive because we cannot control its concentrations when used in the field."

▶ **Shop Tour**—A walk through Airwork's engine overhaul and inspection shops at Millville indicates the international nature of the company's clientele. Some customers: Trans-World Airlines, Ethiopian Airlines, Civil Air Transport (Formosa), and airlines in Greece, Italy, Turkey, Venezuela and Argentina, among others.

Airwork recently installed a hard chrome plater for crankshaft journals and prop shafts. The company says this saves customers about $500 (on R1830s and R2000s) every time a serviceable part is replated rather than replaced.

OFF THE LINE

Six types of military transport aircraft now are undergoing overhaul or modification at Temco's Greenville, Tex., plant, with the arrival of the first of 87 Air Force C-46s. Temco will inspect the planes and perform necessary repairs and maintenance. Contract is expected to run through August 1955.

Pneumatic pressure regulator valve puts "feel" into power boost rudder control system of Convair F-102. Developed by Air Associates, the valve is 8 in. in diameter, 7 in. long, and is said to be considerably lighter than similar equipment. It operates from a pitot tube, which senses the aircraft's speed and adjusts the load on the rudder controls in direct proportion to the plane's velocity.

Two-and-one-half-million-dollar Air Force contract for overhaul of R2600-29A engines has been awarded to Aerodex, Inc., Miami. The new contract is expected to provide work for 450 employes through September 1955.

Much power in a small package: a spokesman for a large engine manufacturer recently underlined the great strides being made in this country to produce turbojet engines of enormous power by citing this comparison: to pierce the sound barrier in level flight, today's fighters must have the propulsive power of a B-36, all packed into a single powerplant (and twin-engine configurations are coming along).

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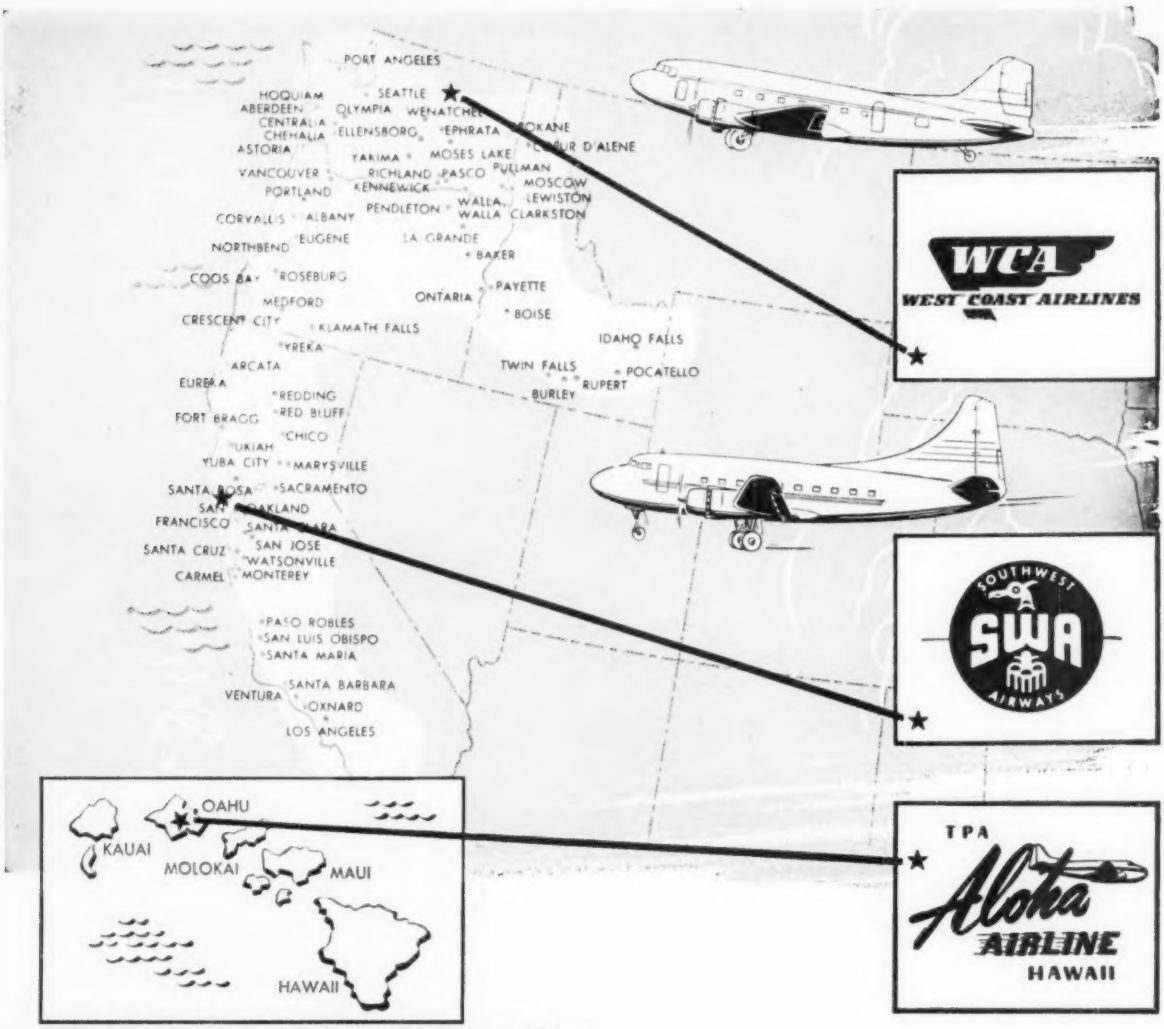

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TABLE NO. I

Airline Dividends—Record and Forecast

	Calendar Years				
	1954*	1953	1952	1951	1950
American—common	$0.60	$0.50	$0.50	$0.50	$0.25
—preferred	3.50	3.50	3.50	3.50	3.50
Braniff	None	None	None	0.50	0.25
Capital	0.15	None	None	None	None
Colonial	None	None	None	None	None
Continental	0.50	0.50	0.50	0.50	0.25
Delta-C&S[1,2]	1.20	0.95	1.00	0.75	0.25
Eastern	0.50	0.50	0.50	0.50	0.25
National[1]	0.60	0.50	0.50	0.25	None
Northeast	None	None	None	None	None
Northwest—common	None	None	None	None	None
—preferred	1.15	1.15	1.15	1.15	1.15
Pan American	0.80	0.65	0.50	0.50	0.25
TWA	None	None[3]	None	None	None
United—common	1.50	1.50	1.50	1.50	0.75
—preferred	4.50	4.50	3.00[4]	...	...
Western	0.60	0.60	0.60	0.50	None

Notes: * Author's minimum estimates.
[1] For fiscal years ended June 30.
[2] Experience of Delta prior to 1953.
[3] Paid 10% in stock, January 1953.
[4] Present series issued March 1952.

Airline Dividends in for Rise?

EAL's decision to double size of payments and make them quarterly may indicate new industry trend.

Eastern Air Lines' recent announcement that it is doubling its annual dividend rate and going on a quarterly disbursement schedule was received with satisfaction in investment circles. It is a strong manifestation of the airline industry's improved stability.

The recent EAL action serves to place all dividend-paying airlines on a regular quarterly basis. (Pan American's dividends are not designated as regular quarterly disbursements, but as a practical matter they are so regarded.)

Starting in the second half of 1950, Eastern had been making semi-annual payments of 25 cents per share. This rate has been maintained until the most current declaration of 25 cents per share which was labeled as the new quarterly rate in lieu of the former semi-annual disbursement. As matters now stand, however, only a total of 50 cents per share will be paid during 1954 with the $1.00 annual rate not becoming effective until 1955.

▶ **Plowing & Reaping**—Eastern is among the more successful airlines, with a consistent earnings record. But in the past, this carrier has paid the least in dividends, while persistently plowing back the bulk of its profits into equipment and other facilities. While this course builds up equity positions, it withholds from stockholders any immediate cash return.

Up until recent years, the airline industry has been notorious for its sporadic cash dividends and lack of regular schedules of payments. This is characteristic of an industry constantly expanding and requiring almost continuous re-investment of earnings. The attraction of airline equities is and has been in the growth qualities of the industry and the hope that a rising earnings curve would be reflected in greater financial substance.

In the formative years, this condition has made for a degree of tolerance among airline investors as capital resources were being husbanded for expansion purposes at the expense of dividend payments.

▶ **Time for Dividends**—An important transition, however, appears in the making for a number of airlines. This has been brought about by the buildup of equity positions to the point where they can more readily support present and the immediate foreseeable scale of operations.

In addition, it has now become apparent that, to compete for investment consideration among other industrial groups, air carriers must also provide a similar measure of income return to stockholders.

As a broader and more diversified group of investors has been attracted to the air transport industry, there is no longer the same patience in forbearing current income as prevailed in the past when speculators and the more sophisticated investors supported airline equities because of the capital gains prospects.

This growing pressure for larger dividends is accentuated by the competitive investment factors prevailing among broad industrial groups affording attractive prospects in earnings and dividends.

This competitive investment condition confronts the airlines with the necessity of providing a larger income return than has existed in the past. An excellent means of warming the hearts of stockholders is regular, quarterly cash disbursements. They then receive at least four tangible demonstrations during the year of the company's progress, all serving to create a cumulative favorable impression.

▶ **Greater Stability**—Table No. I reveals the per share dividend record of the entire air transport industry for the past five years, including this writer's estimate for 1954. It can be seen that a record of stability is being established

TABLE NO. II

Big Four 'Payout'

Cash Dividends as a Percentage of Earnings

Airline	1953	1952	1951	1950
United	45.7%	37.2%	41.9%	25.9%
American	26.0	29.1	35.2	18.0
Eastern	15.6	14.6	16.6	11.0
TWA	None	None[1]	None	None

NOTE: [1] Paid 10% in stock.

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for the airlines that have been paying dividends.

Table No. II discloses the dividend "pay-out" record (dividends as a percentage of earnings) of the Big Four airlines for the past four years through 1953. It is evident that United has consistently been the most liberal in this respect to its stockholders. United is now on a regular 25-cent-per-share quarterly basis. This year, and in 1952 and 1953, year-end extras of 50 cents per share were paid.

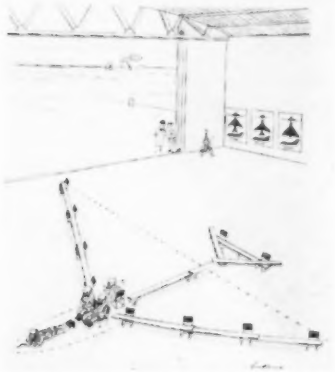
▶ **Capital Dividend?**—It is also possible that Capital Airlines may join the ranks of dividend-payers this year. The last dividend paid by this airline was in 1945. With the noteworthy equity buildup of from $3.33 per share at the 1949 year-end to around $15.00 per share at present, together with the consistent earnings of the past six years, Capital's management may become more disposed to reward its patient stockholders with a dividend disbursement.

The sound financial policies evident in the Capital management record would also indicate that any dividend resumption would be premised on the expectation that once started these payments could be continued on a regular quarterly basis.

Colonial Airlines remains with the dubious distinction of not having paid any dividends to stockholders during its entire corporate existence. Also absent from the dividend lists for at least the past three years (including 1954) are Braniff, Northeast, Northwest (common), and TWA.

On the whole, however, the dividend prospects for the industry look more promising than ever. As long as the trend of present earnings prevails, it is likely that recently established disbursement rates will at least be maintained and possibly augmented during 1955.

—Selig Altschul



"The chaps can hardly wait for the new bombers they see every year at Farnborough."

PUNCH

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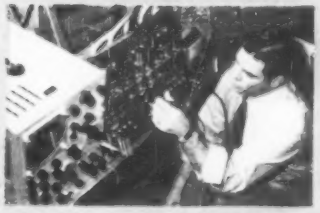

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Among the many unusual design features of Lockheed's YC-130 turbo-prop transport for personnel or cargo, is the Menasco-built landing gear, arranged in tandem to facilitate operation of this airplane from small fields or rough forward airstrips.

Menasco was first to deliver complete aircraft landing gear utilizing high heat treat steels with ultimate tensile strengths from 260,000-280,000 PSI, and 20% saving in critical weight. Comprehensive research by Menasco into *all* aspects of high heat treat was necessary for the production of the landing gear for the new Lockheed YC-130, an airplane whose tremendous load-carrying capacity requires rugged performance of its landing gear. Pioneering accomplishments like this improvement of existing basic materials is one of the reasons why leading aircraft designers constantly look to Menasco Manufacturing Company for advanced ideas, originality of design and progressive techniques in the production of better landing gear.

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Higher Airline Profits, Mergers Urged

Major policy statements of vital concern to the airline industry were presented last week by Oswald Ryan, a Republican member of Civil Aeronautics Board and former CAB chairman, and C. R. Smith, president of American Airlines.

Ryan stressed the need for profits to finance equipment conversion.

Smith criticized CAB's subsidy policy.

Smith Says

Sharp criticism of the Civil Aeronautics Board subsidy policy and support for the Air Coordinating Committee Air Policy Report were expressed by American Airlines Smith in a speech to the National Defense Transportation Assn. in Pittsburgh.

Smith's views on an effective national air policy included the following proposals:

• **Trunklines.** Merger of all U. S. trunkline routes and services into logical operating systems that can be operated without government subsidy.

• **Overseas airlines.** Eliminate wasteful competition by U. S.-flag lines in international operations by assigning single carriers sole operational rights over specific overseas routes.

• **Local service airlines.** Aid feederlines to find methods that will decrease their dependency on government subsidy and continue their operations as an integral part of U. S. air transportation.

• **Military air transport.** Replace obsolete transports now being operated by the military with modern equipment and give more attention to air transport in the military program.

Smith said most of the airline industry believes trunkline services can and should be merged into efficient systems. "It is not being done," he said, "for the reason that CAB seems inclined to guarantee the continued existence and solvency of individual corporate carriers. . . . Such a policy removes the usual economic justification for merger."

▶ **Growing Tendency**—He noted that Section 406-B of the Civil Aeronautics Act provides for subsidy payment only when the service required is in the national interest at the time payments are made.

"There seems to be a growing tendency in the government to apply that provision as though it said a subsidy should be paid to any needy carrier that holds a certificate of convenience and necessity. . . ." AA's president said. "Such an application would ignore the most important part of the statute and attribute an absurd intention to Congress. . . .

"Certainly Congress never intended that airline management was to have its mistakes underwritten by the taxpayer short of the positive showing of dishonesty or inefficiency, faults which are often difficult to prove.

"Under the law as written by Congress, is there any possible justification for subsidizing individual corporations in the trunkline industry if the total of trunkline routes and services can be operated with profit and without subsidy if properly arranged into logical systems by merger?"

▶ **'Laid to Rest'**—Smith said he found no support in the ACC's national air policy report for a revival of the "chosen instrument" philosophy of overseas operations.

"The effort to sanction a 'chosen instrument' was laid to rest by Congress and the federal government many years ago and I believe it impossible to revive."

He criticized the ACC report on international operations on the grounds of vagueness in spelling out an alternative system to the present international competition among U. S.-flag carriers on overseas routes.

"The ACC should finish its job by saying specifically what it is for and what it is against in the organization of overseas air routes for the United States."

▶ **Turboprop Need**—Noting that the U. S. airline transport fleet would number 1,300 planes by the end of 1954, including 629 four-engine transports, Smith criticised the slow progress in the development of turboprop powerplants and military transports.

"Progress in development of more efficient powerplants for longrange transportation has been disappointing," he said. "We very much need a high-efficiency turboprop powerplant of modern design in production.

"The military transport types that have been developed have not been impressive. . . . Too high a proportion of the military transport fleet is still of obsolete types."

▶ **Little Support**—Smith challenged the ACC report on local service airlines and said its recommendations would find little support in communities served by these carriers.

He said the feeder should not be absorbed and operated by trunklines but continued under independent management.

Smith said the local service airlines would continue to require government subsidy but that the size of the support could be reduced substantially in the future and the stronger local carriers eventually could become self-sufficient.

Ryan Says

Ryan advocated bigger profit margins to enable U. S. airlines to finance a $1-billion conversion from piston to turbine-powered transports without falling back on government subsidy.

When Capital Airlines inaugurates service with turboprop Vickers Viscounts next year, Ryan told the St. Louis Chapter of the National Aeronautic Assn., "this airline will usher into being a new age in air transportation in the United States, an age in which jet will be substituted for piston propulsion. . . ."

▶ **Unparalled Costs**—"It is entirely possible that over the next 10 years, or even in less time, the air transport industry will be faced with a capital outlay for as much as $1 billion for new equipment," Ryan said. "That amount is the equivalent of the total capital investment of the industry at the present time.

"When you consider that at the same time the industry is struggling with these enormous problems of the transition from piston to jet it will also be engrossed in the task of completing its transition from a subsidized to a self-supporting industry and of preserving its economic self-sufficiency against further reversion to government aid, you are forced to the conclusion that the financial demands upon the industry will be without parallel. . . ."

He called for cooperation of CAB and the industry: "The regulatory agency would have to be prepared to permit an accumulation of reserve earnings in the prosperous years, and the management would have the opportunity to use such reserve earnings to supplement the deficient earnings in the bad years."

▶ **New Profit Formula**—Ryan said the Board should abandon its present policy of gearing profit to capital investment, low in air transportation, in fixing airline rates. Instead, Ryan suggested,

(*Continued on page 84*)

(Continued from page 83)
profits should be determined by either of these two methods:

• Relate profits to gross revenue, a criteria advocated by Capt. Eddie Rickenbacker, board chairman of Eastern Air Lines, and other industry spokesmen.

• Relate profits to both gross revenue and investment, allowing compensation for "risk," for use of capital and for the attraction of new capital.

▶ **Undermined Confidence**—After adopting the latter standard in one mail rate case in 1942, Ryan explained, CAB returned to its policy of allowing a specified return-on-investment, "since the domestic industry was then subsidized and deficiencies in earnings resulting from the thin profit margin could be remedied by subsidy allowances.

"But now we are confronted with a domestic trunkline industry substantially free from subsidy, and this situation calls for a rate standard better adapted to meet these changed conditions."

He added: "We know from experience that the profit margin in the air transport industry is so small in relation to the total revenues that in unfavorable years it can and does cause losses and the dissipation of the airline investment and that this weakens the confidence of the investing public in this industry. It seems desirable, therefore, that the reasonableness of the profit in this public service industry should be determined in the light of the industry's economic characteristics and of the industry's experience.

"Whatever rate-making method the Civil Aeronautics Board may ultimately adopt for the airline industry, it should be one which will provide a profit that will be fair and reasonable."

▶ **Major Boon**—The acceleration of tax writeoff under this year's new tax law would be a major boon to airlines in replacing their piston fleets with jets, Ryan said in a later speech to the Savannah Rotary Club.

He observed: "The tax burden of an air carrier during the first three years of operation experience for this type of decreased by as much as $100,000 for each million dollars of investment. . . .

"In a re-equipment program of $1-billion magnitude, the industry could receive financial benefits under the new tax law during the first three years of operation of the newly acquired fleet in an amount as great as $100 million."

New ACTA Officers

Aircoach Transport Assn. has re-elected H. B. Johnston of Washington, D. C., as president and named two new members to the nonsked airline organization's board of directors.

New board members: Irving E. Hermann, Great Lakes Airlines, Burbank, Calif., and Kirk Kerkorian, Los Angeles Air Service, Hawthorne, Calif.

Members re-elected to the board: Roy C. Briten, Gus Callas, R. D. Jones, O. L. Morrow and H. B. Robinson.

Other officers elected by the board: A. J. Rome, vice president and general manager; Robert C. Jones, vice president-operations; George N. Astras, treasurer, and Kendall K. Hoyt, director of public relations and sales promotion.

Airwork Sets First Atlantic Cargo Flight

Airwork Atlantic, recently formed division of Airwork, Ltd., has set Mar. 1 for start of trans-Atlantic cargo flights.

John E. Muhlfeld, president of the British airline's new division and former vice president of Pan American World Airways, says two flights weekly in each direction are planned. Douglas Skymasters will be used initially, with three DC-6A Liftmasters due early 1956.

The all-freight service will operate from Milan, Frankfurt, Zurich, London and Prestwick to Gander, Montreal and New York. International Air Transport Assn. rates will be in effect, since the company recently became a member of that organization.

Airlines May Join New AF Turboprop Tests

U.S. airlines have been invited to participate in USAF's turboprop transport test program, to be started early next year by a special six-plane Military Air Transport Service squadron.

A meeting was scheduled late last week at the Pentagon between representatives of 12 airlines and Air Force research and development officers.

"We will hold these exploratory talks with the airlines to determine the extent they wish to participate in the program," an Air Force officer said. "We will discuss all phases of the tests ranging from cost estimates to the feasibility of the airlines flying our turboprop aircraft."

▶ **Modified Airframes**—The USAF turboprop service test program has been pushed by Roger Lewis, Assistant Air Force Secretary for Materiel, to gain operation experience for this type of transport. Aircraft to be assigned are:

• **Two Convair YC-131s,** equipped with twin, 3,750-hp. Allison YT56 engines, and Aeroproducts propellers.

• **Two Boeing YC-97Js,** powered by four 5,500-hp. Pratt & Whitney Aircraft YT34s that drive Curtiss-Wright propellers.

• **Two Lockheed YC-121Fs,** using four P&WA YT34s with Hamilton-Standard propellers.

All aircraft are standard airframes, modified to take turboprops.

▶ **Continental Test Routes**—The new squadron will be based at Kelly AFB, Tex., under MATS' Continental Division. The aircraft will be used in routine domestic cargo operations, carrying military equipment to installations within the U.S.

"Mission of the new squadron," says MATS, "will be to test the new type powerplants under rountine operations, accumulating engine flying hours to aid in the development of the turboprop engines."

Personnel from MATS will be trained at engine and aircraft factories and at Edwards AFB, Calif., prior to squadron assignment.

CAA Airport Official Under Investigation

Commerce Department is investigating allegations that Phillips Moore, former chief of Civil Aeronautics Administration's Office of Airports and a onetime candidate for CAA Administrator, accepted gratuities from the Dade County (Fla.) Port Authority.

The allegations grew out of a federal grand jury investigation in Miami.

▶ **Funds Involved**—Moore was placed on annual leave Sept. 25 and relieved of his duties as District Airport Engineer for CAA. The Commerce Department refuses to reveal the results of the investigation.

Involved in the investigation are funds granted to Miami International Airport, controlled by the Dade County Port Authority.

CAA says Miami International has received $4,825,380 in federal airport aid. The airport is scheduled to receive $300,000 from fiscal 1955 funds.

▶ **'Tough Break'**—A CAA spokesman says: "It is certainly a tough break for us. Miami International probably would have received its grants in any case because of the large amount of traffic handled.

"CAA has handled about $200 million in airport grants since the program started in 1947 without any bad apples. It is the first case of any irregularity in our program."

Moore was appointed director of the Office of Airports in 1948 after 15 years in the field of airport design and construction. He remained as director until soon after the 1952 national election, when he was transferred to Miami as a district engineer.

Commerce and CAA officials are uncertain about the extent of action that can be taken in the event the allegations are proven.

Air Fare Outlook: Stable for 1955

European airlines plan boosts to meet higher costs; other areas generally will hold or even cut prices.

By Frank Shea, Jr.

Airline passenger fares during the next year will remain stable in most parts of the world, according to conclusions reached at the International Air Transport Assn.'s recent traffic conference in Venice.

Only major changes will be within Europe, where a wide range of adjustments is planned to meet rising operating costs and iron out differences in the tariff structures between countries that "have become most apparent after a full year of tourist-class operations."

These adjustments will involve increases of 2.5% to 5%, it was decided. On the reduction side, there will be some cuts in fares in and out of Yugoslavia, along with a slight drop in special tourist fares between Britain and the Scandinavian countries.

Delegates also set up a new European fares board to establish special rates for off-season and night services to insure that they "increase traffic and do not dilute normal revenues."

▶ **Area Adjustments**—Other fare-structure decisions arrived at during the meeting:

• **Western Hemisphere.** Within the Americas, rates will be maintained at their present level, with a few minor adjustments expected. These include some cuts of 7% to 8% in aircoach fares in Central America between Mexico City and Panama, as well as several new excursion tariffs within the Caribbean area.

• **Europe-Middle East-Africa.** Fares are expected to remain generally the same, except for increases up to 5% between European points and Dakar, and between Europe and Madagascar. The latter will apply chiefly to first-class services.

In addition, there will be some cuts in fares between the eastern Mediterranean and the Middle East.

• **Far East.** The rate structure will change somewhat, with new roundtrip excursion fares—about 12.5% below present aircoach tariffs—for services within the Far East. Otherwise, areas within the Far East and Pacific and between this region and Europe generally will remain unchanged.

• **North Atlantic.** Rates between Europe and the U. S. also will stay the same, with minor adjustments expected for through fares to interior points in Europe made necessary by changes in European tariffs. Plans call for a special group to meet in Bermuda in March to discuss special off-season arrangements in an attempt to boost traffic during slack months.

• **North Pole.** A fare setup, necessitated by Scandinavian Airlines System's inauguration transpolar flights this month, was decided for first-class services from Copenhagen to the west coast of North America via Greenland and Canada.

Because of the shorter distance between these points as against normal routes across the U. S. and over the North Atlantic, the North Pole fare will be about $18 cheaper to and from certain Scandinavian points.

• **South Atlantic.** Services will continue to operate under existing fare levels, except for introduction of a new Class B discount about 20% below tourist-class levels for Spain-South America flights in non-pressurized aircraft.

• **Mid-Atlantic.** Picture will not change at this time, but it was decided that a special working group attempt to rationalize the mid-Atlantic structure during the coming year.

• **Trans-Pacific.** Fares will remain generally unchanged over all routes between the Far East, Australasia and Americas.

Conference delegates spent a great deal of time in the review and revision of standards for physical differences between first-class and aircoach services. Big criticism up to now is that there has not been enough difference between the two services to warrant the wide fare differentiation.

▶ **Future Transports**—Major accomplishment was agreement on a new list of specified minimum seating densities for tourist-type aircraft now in use, eliminating a number of the special exceptions allowed during the past year.

In an attempt to set longrange specifications that will assist airlines and manufacturers in designing future aircraft specifically for tourist services, the conference delegates adopted in principle a formula that sets limits in terms of allowable floor space per passenger and a correlation between the width and pitch of the individual seat.

Since it was believed that this formula still fell short of fulfilling some requirements, delegates voted to set up a joint committee of airline technical and commercial experts to study the problem in relation to all aircraft now in use, with a view toward its possible adoption by the conferences as an absolute rule next year.

Some alterations were made in the rules for aircoach amenities in order to reinforce the restriction that tourist meals should be simple and inexpensive, at the same time allowing more substantial breakfasts and giving carriers the necessary flexibility to express national characteristics within the limits of tourist menus.

▶ **Tighten Rule**—For the expressed purpose of making their worldwide tariffs more "efficient and economical," as well as to prevent the attrition of normal revenues, the conference delegates tightened up generally on special discount provisions—among them the so-called "open-jaw" rule whereby roundtrip deductions are given for journeys that begin and end in nearby cities, rather than in the same place.

Existing provisions for students discounts, set when only first-class service was available on the routes affected, also were reviewed in the light of the spread of aircoach and B-class services throughout the world.

Delegates said these services now go a long way toward providing substantially cheaper travel within the normal tariffs for students traveling between homes and schools abroad and agreed that discounts should be reduced from 50% to 25% in most areas.

▶ **'Wide Differences'**—On air cargo rates across the North Atlantic, it was decided to defer for the time being any agreement in order to have more time to reconcile "wide differences of opinion" as to the best way to expand the volume of airfreight between Europe and North and South America.

Michel de Villeneuve, vice president of Air France and chairman of the traffic conferences, said further conversations between the 13 airlines directly involved may "close" the Atlantic cargo rates before agreements expire Mar. 31.

The airline delegates also decide not to absorb in their fares any airport service charges levied against passengers and shippers by governments.

Next year's traffic conference sessions will be held somewhere in the eastern U. S. to coincide with IATA's annual general meeting, also to be held in this country.

S&WA Boosts Payload On Super Connies

Seaboard & Western Airlines' new Super Constellations are equipped to carry more passengers than any other version of the Super Connie.

Seaboard's planes accommodate 93 seats—91 for passengers, two for stewardesses. Eastern Air Lines' Super Connies seat 88 passengers.

Other S&WA cabin equipment includes a galley and music from a tape recorder. An S&WA spokesman says: "The military are really getting their money's worth out of using our Super Connies to transport their personnel."

Arbitrator Backs 8-Hr. Flight Waiver

It now appears certain that Civil Aeronautics Board's waiver of the 8-hr. flight limitation for nonstop transcontinental flights will stick.

In a preliminary arbitration award on the strike of American Airlines pilots over the controversial flights (Aviation Week Aug. 30, p. 52), David L. Cole, mutually selected neutral, has recommended that AA's nonstop coast-to-coast DC-7 schedules be continued—subject to conditions and restrictions to be worked out between the company and the Air Line Pilots Assn.

Cole, former director of the Federal Mediation and Conciliation Service, met with representatives of the airline and ALPA for several weeks at Ithaca, N. Y., before rendering his award.

In his report, Cole says he found tensions so built up over the issue that he believed it wise to make "only preliminary recommendations at this time to serve as guides to the parties for trying to resolve their remaining differences themselves."

If they fail to do so, he plans to make his final report and recommendations before the end of this month.

Cole notes the fact that CAB waived the 8-hr. flight limitation for these schedules on grounds that it would not impair safety. He says both American and ALPA now understand that all other operations will be subject to the 8-hr. rule.

He suggests a series of possible conditions to be used, singly or in combination, as appropriate protective devices against extending flights in excess of 8 hr. per day to other operations.

A strong recommendation also is made for suitable time off for nonstop transcontinental pilots in return for the additional effort required of them.

Cole hopes these recommendations will pave the way toward settling the issue through direct AA-union conferences.

American and ALPA officials queried by Aviation Week on the Cole report declined comment, noting that both sides had agreed not to release statements until attempts had been made to comply with the mediator's recommendations.

Carmichael Proposes Airline-Rail Truce

As railroad revenues continue to drop, two top airline spokesmen warn against a futile effort to solve rail problems by hampering development of air transportation:

• **Capital Airlines'** President J. H. Carmichael, in a notable peace overture, stresses areas in which airlines and railroads can work together to block restrictive government regulation and interference, fight transportation taxation and discourage "gypsy" operations on nonsked airlines and truckers.

Although serious differences of viewpoint exist between rails and airlines, Carmichael says, "they are not so serious that they should split the transportation industry into widely separated opposing camps."

• **Stuart Tipton,** Air Transport Assn.'s general counsel, urges the Administration to determine "the inherent and publicly usable advantages of the railroads" in its attempts to invigorate them.

In a statement to Secretary of Commerce Sinclair Weeks, chairman of the Cabinet Committee on Transport Policy and Organization, Tipton emphasizes that "the solution to the railroad problem is not to be found by seeking to arrest technological progress or by attempting to impede the public's use of other forms of transportation."

▶ **Defends Mail Haul**—The Cabinet committee is to submit its report, outlining Administration position on matters relating to all forms of transportation, by Dec. 1.

The committee is concerned primarily with railroad policy, since Administration studies already have been made on civil aviation and marine policy.

The committee is expected to accept the civil aviation policy recommendations of the Air Coordinating Committee (Aviation Week May 3, p. 12).

▶ **Fact of Life**—Extensive and increasing participation by the air transport system in the transportation of passengers and mail, Tipton stresses, "must be accepted as an economic fact of life. No progress can be made in meeting the troubles of the railroads by investigating measures which can be taken against the airlines."

Over the years, "due in large part to the railroad efforts," he says, "the pattern has been established of 'doing something to somebody else' as the principal method of solving the railroad problem. Nevertheless, the railroad problem persists and becomes more aggravated, if anything, with the passing of time. . . .

"The railroads are, and will continue to be, essential, and there are many services for which they have inherent advantages. These areas of service must be sought out and constructed rearrangement of operating and rate-making practices achieved. This is the only way to solve the chronic 'railroad problem'."

▶ **Pot-Shot Damage**—In a speech to the Central Railway Club of Buffalo, N. Y., Carmichael observed: "To continue to take pot-shots at one another, to ignore the fact that there are many issues on which we stand on common ground is to interfere with normal progress. We keep the transportation industry at loose ends, fragmentary and impair its overall efficiency."

He took issue with the time-lag problem in railroad rate and abandonment proceedings and other "outmoded and restrictive regulations which have hog-tied the railroads for years." Although "it is quite a convenience to have an outside source restrict the activities of a very potent competitor," Carmichael commented, "these restrictive regulations can spread. It is logical to assume that if they work against the railroads, they will work against the airlines. . . ."

He suggested organization of a "common front" by airlines and railroads to combat "carriers which are allowed to run free and do all of us harm because our regulations prevent us from giving them a fair battle."

Of the "few" basic sources of contention between the two forms of transportation, Carmichael said:

• **First-class mail.** "It is proper that the airlines take over this phase of postal operation. They have the carrying capacity, they can move it faster. . . . The railroads, by asking to retain first-class mail at a slower rate of movement in order to support certain passenger services, are, in effect, asking for a subsidy."

• **User charges.** "The amount airlines pay in gasoline taxes alone is a fair charge for their use of the airways. Landing fees, rentals and other charges more than pay for our use of airports."

Resort Wins Logair Contract From AMC

Resort Airlines, Inc., has been awarded a contract to carry cargo between seven Air Force bases in Air Materiel Command's Logair service and will purchase four additional DC-4s for the operation.

AMC also has renewed contract with Capitol Airways, Nashville, Tenn., and American Air Export and Import Co., Miami, Fla. (Aviation Week Aug. 16, p. 140).

All three contracts will expire June 30, 1955.

Resort expects to fly about 2,115,000 revenue ton-miles a month and bring in a monthly revenue of $250,000. The company already has five C-46s carrying cargo from coast-to-coast for the Navy.

Capitol's contract will run to approximately $988,000, and Axico will collect about $1,222,000.

ACC Report . . .

Civil Convertiplane Seen by 1965

Committee study spotlights need for military aid, with industry retaining top responsibility for success.

Convertiplane development will progress under military sponsorship to the point where a commercial version can be available in about 10 years, but basic responsibility for success of the program rests with the aircraft industry, Air Coordinating Committee reported last week.

In a 58-page report on "The Convertiplane: Implications of a New Aircraft Type on the National Aviation Policy of the United States," the committee endorsed these recommendations:

- Development of technical experience with the convertiplane should be accelerated.
- Military convertiplane programs should be designed to give maximum benefit to civilian use, within the requirements of national security.
- Civil agencies and the military should exchange information in order to get fullest possible civilian utilization of the military program.
- Basic responsibility for the development of a commercial convertiplane still rests with the aircraft industry, and the industry should make sure military designs still meet civil airworthiness standards.
- When convertiplanes are available, the federal government should provide or subsidize a program of simulated airline operation.

ACC's recommendations were drawn up by working group of experts under the chairmanship of Col. William B. Bunker, former Assistant Chief of Army Transportation and now in charge of the Aviation Training School at Ft. Eustis, Va.

▶ **Commercial Need**—The working group said that while current work is being done primarily for military reasons, any additional federal sponsorship of convertiplane progress can be justified only because of possible commercial applications.

On this premise, it was pointed out that future substantial advances on airplanes must come from invasion of the shorthaul market, where buses and trains now carry the majority of passengers.

In this field, the report said, both the fixed-wing airplane and the helicopter have disadvantages: The fixed-wing plane is handicapped by ground time operations and the fact that it lands at a point remote from the downtown area. For the helicopters, low forward speed makes the true rotary-wing aircraft only a partial answer to the problem.

▶ **150-700-Mi. Range**—Through a study of downtown-to-downtown speeds and operational costs, the group concluded that a convertiplane should be able to operate effectively in the range of 150 to 700 mi., where traffic now is dominated by railway coach service.

The report said there is an estimated potential of about 133 million passengers a year that the convertiplane could take away from the railroads.

The rub: Few will be willing to go by air "on the strength of a saving in elapsed journey time, unless such service is offered at a price reasonably similar to that which the traveler is accustomed to paying."

▶ **ATA Recommendations**—In order to integrate a military design into commercial use, the report said, certain requirements must be met. They include several recommendations of Air Transport Assn:

- Design payload should run from 6,000 to 10,000 lb., with a passenger capacity of 30 to 50.
- Cruising speed should be as high as possible but it should not be less than 160 mph.
- Multi-engine power is needed with a high standard of single-engine performance.
- The convertiplane must operate in all weather, with a minimum range of 250-300 mi.
- The requirement that direct flight cost per seat-mile should not exceed twin-engine aircraft may be unreasonable. The ACC committee believes that on ranges of more than 150 mi., the convertiplane will be cheaper than the helicopter but more expensive than the airplane.
- It is up to the manufacturers to refine design, cut operating costs, make all-weather flight practicable and solve the noise problem.

▶ **Immediate Mission**—In the military field, the report said, convertiplanes have an immediate mission with all services:

- **The Air Force** can cut down on the training and hazard problems of paratroops. USAF needs convertiplanes as assault transports, troop and supply carriers and for rescue and reconnaissance missions.
- **The Navy's** most obvious use would be in Marine assault operations. Other fields would be anti-submarine war, liaison and utility—now covered by helicopter designs.

For Marine assault use, the ACC committee said, recent design competitions in the helicopter field have sought "transports and observation aircraft with speeds comparable to those expected with convertiplane configurations. However, because of budgetary limitations or the state of the art such competitions have not resulted in any firm hardware."

- **The Army** has more stringent landing field requirements than the other services. However, these needs are being met by lightplanes and helicopters, and the fact remains that most Army tactical and logistical operations are over short distances.

For this reason, the report said, the Army will support the convertiplane program only to the extent that higher speeds can be achieved without undue penalty over the helicopter.

- **For civil defense**, the group reported, the convertiplane could take on disaster area assignments "more effectively than the helicopter" and "should be instantly available" either from the military or commercial airlines.

Preceding its recommendations, the committee has presented a review of the "state of the art," concluding that a satisfactory convertiplane now is technically possible but more federal action is needed to spur development of such a craft (AVIATION WEEK June 28, p. 26).

In addition to Col. Bunker, members of the ACC working group were: Richard K. Waldo, until recently a

707 Block-to-Block Speeds

Boeing Airplane Co. now is quoting flight time figures for a commercial passenger version of its four-jet 707 Stratoliner, comparing them with fastest airline schedules of present transports.

Figures for the 707 are block-to-block times, including normal ground maneuvering and winter headwinds where applicable, Boeing says.

Today's fastest schedules		707	Times saved
New York-Los Angeles	7 hr. 55 min.	5 hr. 38 min.	2 hr. 17 min.
New York-London	11 hr. 30 min.	7 hr. 16 min.	4 hr. 14 min.
New York-San Juan	5 hr. 35 min.	3 hr. 16 min.	2 hr. 19 min.
New York-Miami	3 hr. 30 min.	2 hr. 20 min.	1 hr. 10 min.

planning officer with Civil Aeronautics Administration; E. Bruce Miller of Civil Aeronautics Board; Robert Rosenbaum, alternate for CAA; R. J. Wellman, Headquarters, USAF; Robert S. Knecht, assistant head of the Rotary- Wing branch, Navy Bureau of Aeronautics; Norman J. Asher, Navy alternate, and Ronald C. Kinsey of ACC.

Lufthansa Group Visit U. S. Aviation Plants

Five members of a technical advisory committee to Lufthansa, West Germany's airline, have arrived in the United States for a 21-day tour of aircraft plants.

Headed by Prof. Leo Brandt, State Secretary for the Economics and Traffic Ministry of Land, North Rhine and Westphalia, the group arrived in Boston and stopped first at the United Aircraft Corp., East Hartford, Conn.

Following the UAC visit, the party was scheduled to call at Curtiss-Wright Corp., Wood-Ridge, N. J.; Boeing Airplane Co., Seattle; United Air Lines, San Francisco; and Lockheed Aircraft Corp., California Institute of Technology and Convair in southern California.

In addition to Prof. Brandt, the party includes Prof. Herman Blenk, president of the German Research Institute for Aviation; Prof. August Quick of the Technical University at Aachen; Dr. Otto Lutz, professor at the Technical University at Braunschweig, and diploma engineer Gerhard Hoeltje, a member of the board of managers of Lufthansa.

While Lufthansa already has ordered Convair-Liners and Lockheed Constellations (AVIATION WEEK Oct. 11, p. 99), the State Department said the German group is interested in other aircraft and technical developments of American aircraft manufacturers.

Iberia, Lockheed Sign Maintenance Contract

Iberia Airlines, the Spanish carrier, and Lockheed Aircraft Service-International have entered into an integrated maintenance and overhaul agreement covering three Lockheed 1049E Super Constellations now used on trans-Atlantic runs.

Operating on a fixed-price-per-hour basis, LASI will perform all services required to keep the aircraft in airworthy condition—including regular inspections, overhaul of components, propellers, engine accessories, flight instruments, radio, emergency equipment and cabin furnishings.

Iberia's three Super Connies have been running regular service between Spain and the U. S. since August, making three roundtrips weekly between Madrid and New York.

SAS Builds Facilities For New Polar Flights

Los Angeles—Scandinavian Airlines System's new facilities here are nearing completion preparatory to the Nov. 15 inaugural polar route flight from Los Angeles to Copenhagen, Denmark.

They include a new passenger terminal, sales and reservations office; ticket counter and lounge at the airport, and kitchen quarters.

▶**West Coast Center**—A completely remodeled building in Beverly Hills will house the passenger terminal, sales and reservations office—headquarters for the Los Angeles operation. In addition to sales, reservations and ticketing activities, this office will become an extensive communication relay center for the Orient and for SAS offices in Seattle and San Francisco.

A new ticket counter at the airport will be opened by Nov. 15.

The airline will maintain its present downtown Los Angeles offices as a supplemental sales and reservations center.

All aircraft maintenance will be handled by Western Air Lines with an SAS mechanic on duty to supervise the work.

▶**First Flights**—Inauguration of the polar route flight marks the start of a regular West Coast-Europe run, with beginning service to include two weekly departures from Los Angeles.

A 32-passenger DC-6A will leave International Airport on Mondays and Thursdays at 12:05 A.M. (PST), fly to Winnipeg, Canada, then pass by the North Pole to Greenland and arrive at Copenhagen, Denmark, at 9:30 A.M., local time. Flying time: 22 hours; elapsed time; about 24 hours; distance 5,800 mi.

Fare will be $574.70 one way, $1,047 roundtrip. Berths will be available at $50 extra per trip.

"We feel this service is going to be a huge success," says Peter Tornquist, who opened West Coast representation for SAS eight years ago. "Los Angeles is the richest potential travel area in the West. . . ."

CAB Enters Fight On Airline Curbs

Civil Aeronautics Board is lending strong support to airlines operating from New York's International (Idlewild) Airport in their fight against an ordinance enacted by a nearby Long Island community to prevent transports from flying lower than 1,000 ft. over the village.

A federal judge signed an injunction in 1952, preventing the village of Cedarhurst, N. Y., from enforcing its ordinance. The ordinance is being tested in Brooklyn Federal Court, with the airlines pressing for a clear-cut decision on the measure's constitutionality.

At the trial, which opened Oct. 25, U. S. Attorney Leonard P. Moore appeared to represent the interests of CAB, intervening as "a friend of the court." Moore said the village is attempting to establish powers in a field entirely pre-empted by the government.

Pointing out that there are villages adjoining every major airport in the country, Moore said that to grant such powers to local communities conceivably would open the way to prevent normal operations by the airlines serving these points.

Cedarhurst enacted the legislation Mar. 31, 1952, following the three major air crashes near Newark (N. J.) Airport that resulted in casualties among residents of nearby Elizabeth.

Counsel for Cedarhurst claims the Air Commerce Act of 1926, which established federal regulation, is unconstitutional because Congress has not prescribed safe flight altitudes.

CAB Refuses to Rule On Mexico City Route

Eastern Air Lines has been turned down again by Civil Aeronautics Board in its effort to get a ruling on the status of the New Orleans-Mexico City route EAL never has been able to use.

Earlier, CAB had denied an Eastern

Weight Lifter

A Sikorsky S-55 copter lifts a small French auto high off the ground during a recent automobile show in Paris, giving passersby an unusual view of the new car.

motion for a declaratory order affirming the present validity of the route and asking that the nonstop New York-Mexico City service case be put off until such an order is issued. The airline filed another petition asking the Board to reconsider its decision, and this also was denied.

Hearings on the nonstop case are scheduled for Nov. 8.

CAB ORDERS

(Sept. 23-Sept. 29)

GRANTED:

Port of New York Authority, City of Montgomery, Ala., Montgomery Chamber of Commerce, Mississippi Aeronautics Commission and Raleigh-Durham Airport Authority leave to intervene in the additional Southwest-Northeast service case.

Lawrence Aircraft Service's application for an exemption authorizing the employment of pilots, with specified restrictions.

Allegheny Airlines' application for an exemption to overfly Johnstown and Altoona, Pa., for one year with certain provisions.

North Central Airlines' application for a temporary exemption authorizing service to International Falls, Minn., until NCA's application for year-round service is decided.

Photographic Survey Corp. Ltd.'s application to perform aerial photograph and airborne profile recorder flights from Oct. 1, 1954, to Oct. 25, 1954.

Ozark Air Lines' application for temporary suspension of service at Memphis, Tenn., Jonesboro, Ark., Miami, Tulsa and Bartlesville, Okla., Coffeyville, Chanute, Topeka and Kansas City, Kan.

Northeast Airlines' application for temporary suspension of service at Bar Harbor, Me., between Sept. 26, 1954, and Oct. 31, 1954.

Secretary of Agriculture's petition to intervene in the airfreight renewal case.

Northwest Airlines' petition to intervene in the proceeding involving Japan Air Lines' application for Okinawa-Hong Kong service.

Piedmont Aviation's application for authority to overfly London-Corbin, Ky., on certain flights.

Spartan Air Services Ltd.'s application to conduct an airborne electromagnetic survey, until Dec. 31, 1954.

Wheeler Airlines Ltd.'s application to conduct aerial photographic survey flights, until Nov. 1, 1954.

APPROVED:

New York Airways' flight pattern involving the transportation of passengers between La Guardia Airport and Newark Airport direct.

DISMISSED:

Albany Airways' application for a certificate of public convenience and necessity, by default.

Nu-Planes Flyaway Service's application for a certificate of public convenience and necessity, by default.

Pan American World Airways' complaint requesting suspension and investigation of a rate proposal by Alaska Airlines, since the rates have been canceled.

Slick Airways rate proposal investigation, since the proposed rates and cancelation of rates have been canceled.

(Sept. 30-Oct. 6)

GRANTED:

Greensboro-Highpoint (N. C.) Airport Authority's petition to intervene in the investigation of the need for air service between Charleston, W. Va., and Columbus, Ohio.

Central Airlines' application for a temporary exemption to serve Ft. Smith, Ark., on Segment 2 until authorized new service on Segments 6 and 7 is inaugurated.

City of Dallas and Dallas Chamber of Commerce petition for reconsideration of a decision to restrict Central Airlines to Amon Carter Field on Route 81 service to Dallas/Ft. Worth.

Braniff Airways' application for an exemption to make stops at Havana Oct. 9 and Oct. 15 on the airline's nonstop Miami-Balboa route.

DENIED:

Portland (Ore.) Chamber of Commerce, Portland Freight Traffic Assn. and the Port of Portland's petition for reconsideration of a decision not to allow United Air Lines to provide nonstop service between Portland and Chicago.

Seattle Chamber of Commerce, Tacoma Chamber of Commerce and the Seattle Traffic Assn.'s petition for a temporary exemption for United Air Lines to provide nonstop service between Seattle/Tacoma and Chicago.

Alaska Airlines' motion to postpone argument in the States-Alaska case 10 days to enable Alaska and Pacific Northern Airlines to conclude merger negotiations. The order says CAB continues to be interested in the merger issue but the importance of the issues in the States-Alaska case need an early decision.

AUTHORIZED:

Japan Air Lines' application for a round-trip Tokyo to Rio de Janeiro, with a stop at San Francisco providing no traffic originates or terminates at that city. The authority terminates Oct. 25, 1954.

ORDERED:

Catalina Air Transport's contract with United Air Lines to operate Catalina's Avalon-Los Angeles route be continued until Oct. 31, 1954, at which time Catalina should be able to take over the service. Catalina's application for a suspension of service from Oct. 1, 1954 to Apr. 30, 1954 is denied.

Eastern Air Lines' application for an extension of Route 5 from New York and Newark to Philadelphia, Wilmington, Baltimore, Washington, Knoxville, Nashville, Memphis, Dallas, Houston, San Antonio and Ft. Worth be severed from Docket 6055 and consolidated into the additional Southwest-Northeast service case.

Resort Airlines be allowed to continue present stopover schedules at Miami on tours until final determination of the Resort renewal proceeding.

SHORTLINES

▶ **Air France** has inaugurated weekly Super Constellation aircoach flights from Boston to Paris. First-class service is planned for next month.

▶ **American and Continental Air Lines** have started a DC-6 aircoach interchange service between Los Angeles and Houston, with stops at San Diego, El Paso and San Antonio.

▶ **Avianca** has sold its 37 airports to the Colombian government. The airline will continue to operate them until the government is set up to take over the job. Plans are underway for a new airport at Bogota, supposed to be able to handle any aircraft now building or in the air.

▶ **British Overseas Airways Corp** will resume aircoach service to Bermuda Nov. 12 and, at the same time, suspend first-class Bermuda service. Flights will be operated three times a week with Lockheed Constellations.

▶ **Indian Airlines** has ordered eight 14-place Herons from de Havilland Aircraft Co. Delivery of the four-engine, shortrange transports is expected to begin shortly.

▶ **KLM Royal Dutch Airlines** has announced schedules for next summer, all to be flown with Lockheed Constellations and Super Constellations. An autumn package trip is offered covering Brussels, Paris, London, Shannon, Dublin and Glasgow—all for the price of a roundtrip ticket to Amsterdam.

▶ **LACSA** now flies four flights weekly from Miami to Costa Rica and Panama via both Havana and Grand Cayman, B. W. I.

▶ **Pan American World Airways** has inaugurated all-Sleeperette service between New York and Buenos Aires, with stops at Caracas, Rio de Janeiro and Montevideo.

▶ **Port of New York Authority** is making some improvements at its Teterboro, N. J., airport. Two runways will be lengthened and a new administration operations building will be built, all at a cost of about $500,000.

▶ **Trans-Canada and Canadian Pacific Airlines** have introduced a special circle tour fare covering their services to Mexico City. Travel can start in either direction on CPA's Vancouver-Mexico City route or TCA's Vancouver-Toronto-Mexico City flights. Circle fare is $340.

AVIATION CALENDAR

Nov. 4-5—American Helicopter Society, first Western Forum, Institute of the Aeronautical Sciences Building, Los Angeles.

Nov. 4-5—Airborne and Navigational Electronics, East Coast conference, Sheraton-Belvedere Hotel, Baltimore.

Nov. 8-9—National Aviation Trades Assn., annual convention and meeting, Biltmore-Terrace Hotel, Miami Beach, Fla.

Nov. 8-9—National Air Taxi Conference, annual meeting, Biltmore-Terrace Hotel, Miami Beach, Fla.

Nov. 8-10—Air Industries & Transport Assn. of Canada, annual meeting, Chateau Frontenac, Quebec City.

Nov. 9-12—Air Line Pilots Assn., convention, Sheraton Hotel, Chicago.

Nov. 10-12—Industrial Management Society, 18th National Time and Motion Study and Management Clinic, Hotel Sherman, Chicago.

Nov. 11-12—Airmail Pioneers, division reunion, Hollywood Roosevelt Hotel, Los Angeles.

Nov. 12-13—National Symposium on Quality Control and Reliability in Electronics, Statler Hotel, New York.

Nov. 15-17—Aviation Distributors and Manufacturers Assn., 12th annual meeting, Mayflower Hotel, Washington, D. C.

Nov. 15-17—Magnesium Assn., 10th annual meeting, Hotel Chase, St. Louis.

Nov. 17-19—California Association of Airport Executives, semi-annual meeting, Sainte Claire Hotel, San Jose, Calif.

Nov. 18-19—American Society for Quality Control, ninth Midwest conference, Baker Hotel, Dallas.

Nov. 29-Dec. 3—American Society of Mechanical Engineers, Aviation Division, annual meeting, New York.

Nov. 30-Dec. 3—American Rocket Society, ninth annual meeting, Hotel McAlpin, New York.

Dec. 17—Wright Day Dinner, Statler Hotel, Washington, D. C.

Dec. 17—Institute of the Aeronautical Sciences, 18th Wright Brothers Lecture, U. S. Chamber of Commerce Building, Washington, D. C.; to be repeated Dec. 20 in Los Angeles and Dec 22 in Cleveland. Lecturer: Bo Lundberg, director of the Aeronautical Research Institute of Sweden.

Jan. 19-23—World Trade Fair of Aviation, Miami International Airport, Miami, Fla.

Jan. 24-27—Plant Maintenance & Engineering Show and three-day conference, produced by Clapp & Poliak, International Amphitheatre, Chicago.

Jan. 24-28—Institute of the Aeronautical Sciences, 23rd annual meeting and Honors Night Dinner, Hotel Astor, New York.

Feb. 20-22—Institute of Surplus Dealers, trade show and convention, 212th AAA Armory, New York.

Mar. 28-Apr. 1—Ninth Western Metal Exposition and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.

Apr. 24-28—Airport Operators Council, 1955 convention, Olympic Hotel, Seattle.

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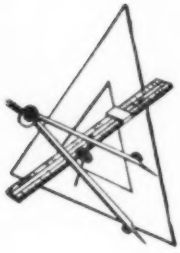

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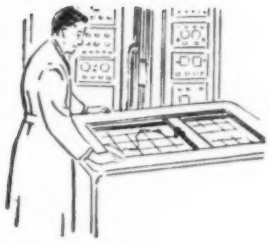

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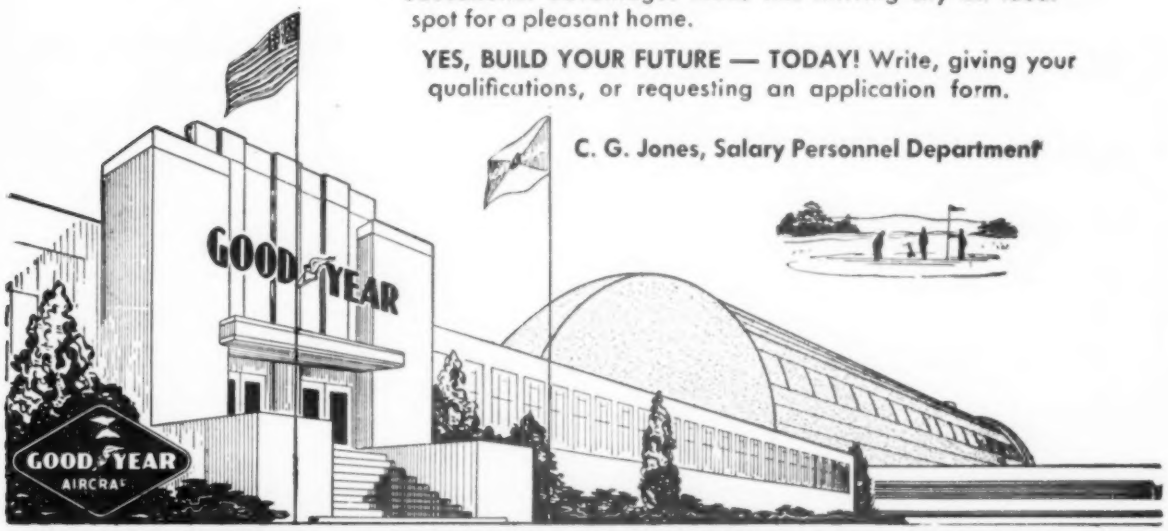

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W. W. Lindsay, Jr., Electronics Committee Chairman (left), Sherwood C. Frey, Navy Studies Department Manager (seated), and R. P. Buschmann, Company Studies Department Manager (right), examine relationships between plane and radar performance.

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Dr. L. Alaoglu, Mathematics Committee Chairman (left), and Ed Quilter, Capt. U.S.N., Ret., Consultant (right), discuss alternate overseas transport routes between the U.S. and Europe.

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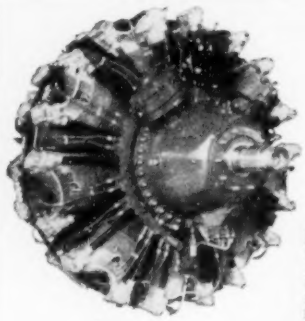

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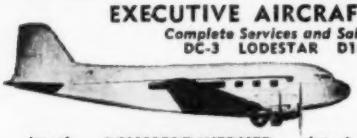

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4,326	-DD5	747	-72	1,651	-34	2,000	-50A
16,306	-DD6	18,492	AN5-DD5	3,102	-34A	1,194	-60A
7,037	-DD6A	3,020	-DD6	1,300	-36	800	AN28-11A
9,186	-DH6A	7,948	-DD6A	8,612	-47	800	-14
2,125	-DD7A	2,688	AN5-7	3,711	-51	666	-14A
4,890	-DD7	2,543	-C7	1,914	-54	4,000	-15A
3,137	-DD10	1,531	-CH7	1,490	AN9-17	2,300	-17
2,180	-DD11	2,578	-CH7A	932	-DD17A	700	-18A
536	-H11A	85,000	-DD7	9,427	-20	832	-20A
5,680	-DD12	17,753	-DD7A	2,913	-25	3,833	-24A
38,300	-DD12A	1,832	-10	3,900	-26	4,619	-29
1,437	-DD13	3,117	-DD10	6,270	-26A	2,225	-29A
1,989	-DD13A	5,838	-H11A	2,100	AN9-30A	1,100	-31
568	-DDH13A	2,443	-DD12A	1,573	-31A	5,700	-31A
3,428	-H13A	1,550	-DD12	544	-32A	7,500	-32A
1,375	-14	4,638	-15	799	-33A	10,000	-36
7,000	-DD14	9,000	-17A	1,651	-34	28,000	-38
10,000	-DD15A	780	-DD17	3,100	-34A	2,250	-38A
1,820	-DD16	4,743	-DD22	1,500	-36	600	-40
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3,382	-DD22	1,684	-36	877	-DD17	650	-19
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882	-DD23	2,740	-40	1,884	-22	7,811	-22
841	-DD24	664	-45A	1,875	-DD22	1,792	-24A
619	-DD24A	800	-47A	4,300	-23	26,477	-38
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632	-23	5,526	-52	1,875	-48A	1,300	-43
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24	-10-11	190	NAS59-32
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761	-12B	126	-56
100	-23	50	NAS60-26
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1,434	-A11	214	-A53.5
1,700	-A12	74	-A54
600	-A13	3,530	NAS62-16
200	-13.5	49	-A16
656	-15	175	NAS80-A11
353	-16	85	NAS144-3
1,286	-25	298	-DH38
370	-27/5	9,188	-15
55	-50	335	-34
539	NAS54-A6	287	-35
4,340	-A6.5	224	-18A
205	-7	1,185	-19
60	-AH7	28	-30
482	-7.5	1,874	-21
471	-10	290	-20
53	-H10A	87	-22
2,078	-A11-5	1,004	-23
160	-A13	304	-24
1,192	-14	900	-A25
536	-H14	184	-29
6,313	-A14.5	3,222	-30
451	-15	1,823	-31
407	-H15	84	-32
57	-A15-5	95	-33
368	-16	367	-34
285	-17	1,080	-38
88	-A21	48	-41
1,989	-21	10,348	-47
324	-H21	352	-48
796	-22	964	-62
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259	-H31	100	-18
300	-A32	295	-DH20
240	-33	300	-21
160	-A40	144	-A21
44	-A41	182	-22
89	-50	134	-24
469	NAS55-A10	28	-DH24
29	-12	80	-25
738	-14	700	-DH25
1,443	-A14.5	1,367	-26R
36	-15	28	-28
388	-H17	31	-30
428	-21	300	-31
85	-A21	1,628	-32
314	-22	20	-33
780	-25	26	NAS145-34
795	-27	487	-38
75	-31	250	-DH42
363	-33	967	-44
95	-34	1,800	-46
585	-35	1,353	-47
48	-71	2,300	-48
105	-73	4,469	-68
265	NAS56-A6	1,126	-75
175	-A6.5	47	-83
20,602	-A6.5	684	-86
940	-7	400	-88
6,168	-A7	189	-95
310	-14	200	-200
95	-15	109	NAS146-18
194	-A16.5	49	-21
64	-A17	9,385	-22
18	-A20	230	-22A
173	-26	80	-24
72	-32	483	-DH26
4,128	-A32	318	-D26
128	-36	268	-A28
485	-36	5,288	-29
25	-42	2,250	-30
30,000	-A65	700	-31
268	NAS57-A7	248	-DH34
363	-A10	98	-33
200	-11-45-5	56	-36
297	-13	571	-A42
485	-A16.5	525	-A44
240	-21	183	-52
91	-24	73	-58
471	-25	38	-DH63
644	-26	189	-64
50	-A27	130	-68
88	-A27.5	100	-ADH70
44	-41	224	-73
160	-A45.5	13	-DH73
123	NAS58-A10	38	-ADH75
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Smoking Impairs Your Vision

Also 'raises your altitude.' Dr. Ross A. McFarland reports after laboratory tests at Harvard University.

By Ross A. McFarland

Scarcely anyone has missed the recent publicity given to the possible connection between heavy cigaret smoking and cancer of the lungs. Most of us have also been exposed to statistics which say that non-smokers tend to live longer than heavy smokers, or that heavy smokers more often develop heart disease.

Whether smoking is the culprit or not, the problems involved are long-range ones, important for the longevity of people in all walks of life. It is less well known that the immediate effects of smoking can be problems to those who fly in aircraft, immediate problems of efficiency and safety.

Tobacco smoke—Nicotine and carbon monoxide are the substances of chief concern in the smoke which enters the mouth and respiratory passages. Various irritants are also present which are responsible for the local effects of smoke on the eyes and mucous membranes. Tobacco tars may possibly influence the formation of cancer, but the evidence for this is not clear. The presence of lead and arsenic resulting from insecticides used on the tobacco plant is of unproven importance.

Nicotine—The tobacco in the average American cigaret is about 2% nicotine. So-called "de-nicotinized" brands containing about 1% have thus eliminated only about one-half of that originally present. When tobacco is burned, only a part of the nicotine is destroyed.

Much of it is volatilized into the smoke. If the smoke is inhaled, almost all of its nicotine is absorbed; if the smoke is not inhaled, about two thirds of the nicotine present is absorbed, through the membranes lining the mouth.

The amounts of nicotine that are taken up by the body from smoking are comparable to the amounts known to have an effect when used in drug form. The general net effect of the drug is to increase the load on the heart.

Carbon monoxide—About 1% to 2.5% of the total volume of cigaret smoke is carbon monoxide, while cigar smoke may contain 5% to 8%. The CO content increases with the thickness of the cigar or cigaret, with the moisture and tightness of packing, and with rapid smoking. Carbon monoxide is absorbed only if the smoke is drawn into the lungs, and inhaling one cigaret results in the saturation of 1% to 1.5% of the blood.

If a person smokes 20 to 30 cigarets per day, he may have on the average of 4% to 8% of his hemoglobin so saturated. This amount of smoking results in a 10% saturation in some people. Some delicate functions, such as night vision, are affected at these levels even though headaches and other symptoms of carbon monoxide poisoning do not usually appear until higher concentrations are reached.

The "Physiological Ceiling"—Hemoglobin, the pigment in the red blood cells, normally combines with oxygen in the lungs, and transports it to the tissues. Unfortunately, hemoglobin also takes up carbon monoxide in the same way. In fact, when carbon monoxide and oxygen compete for space in the hemoglobin molecule, carbon monoxide is favored by odds of about 210 to one.

Very small concentrations of CO can therefore inactivate a large amount of hemoglobin as an oxygen carrier. As a result, a state of oxygen deficiency is produced in the body, which has effects like those of high altitude.

Furthermore, the effects of CO and altitude are additive. As a result, a flier at sea level with a 10% saturation of the blood by CO shows the same effect on a sensitive functional test of oxygen deficiency as if he were at an altitude of about 12,000 ft. If he were at 10,000 ft., the combined effect would be equivalent to that of an altitude of 15,000 ft. The "ceiling" is thus lowered by about 5,000 ft.

Furthermore, once carbon monoxide enters the blood, it leaves very slowly. Some 24 hr. after heavy smoking, appreciable amounts are still present in the blood. This may partially account for some of the hangover effects of heavy smoking.

Smoking and Altitude Tolerance—Studies carried out in low pressure chambers showed that subjects who could tolerate altitudes of 20,000 to 21,000 ft. on days they refrained from smoking were able to reach only 16,000 ft. when they smoked heavily before the tests.

During 1943, the effects of smoking were observed on flight crews engaged in longrange operations between Miami and the Far East. Having experienced much fatigue in these flights, air crews agreed to refrain from smoking on the ground and in the air on several trips. Most of the pilots were convinced that they felt less exhausted and more efficient in performing their duties at the cruising altitudes of 8,000 to 12,000 ft. when they did not smoke.

Another factor involved in smoking may also impair altitude tolerance. Nicotine increases the metabolic rate, or requirement for oxygen, by about 10% to 15%. It has been shown that greater tolerance for altitude accompanies lower metabolic rate. Nicotine also interferes with the action of the autonomic nervous system, the integrity of which is so essential for optimal adaptation to stress.

Smoking and Night Vision—Smoking has an appreciable influence on the ability to see at low levels of illumination; these effects would be of importance particularly in night flights. In my laboratory the sensitivity to changes in the brightness of dim lights was measured before and after three cigarets were smoked in succession. Blood carbon monoxide increased about 1.5% per cigaret, the total uptake being about 4.5%. Sensitivity decreased distinctly after each cigaret; that is, lights had to be brighter to be seen. The total effect on vision from only three cigarets corresponded to that of an altitude of about 8,000 ft.

The Airman and Smoking—Not even the tobacco manufacturer claims that the effects of tobacco on the body are beneficial. The question is whether the harmful effects are really serious and great enough to offset the pleasure of smoking. Available evidence indicates that the immediate effects of moderate smoking are probably not harmful to normal adults.

Among airmen, however, the impairment of vision and lowered tolerance to altitude present an occupational hazard. It would seem wise for aviators to avoid the excessive use of tobacco not only to prolong their useful flying careers, but also to maintain a high degree of fitness in flight. Obviously the average airline passenger might find his flight more comfortable if he avoids excessive smoking.

Dr. McFarland is associate professor of industrial hygiene at the School of Public Health, Harvard University. He is the author of the well-known book on preventive medicine and safety in aviation and industry, "Human Factors in Air Transportation." This is the first of several articles he is writing for Aviation Week.

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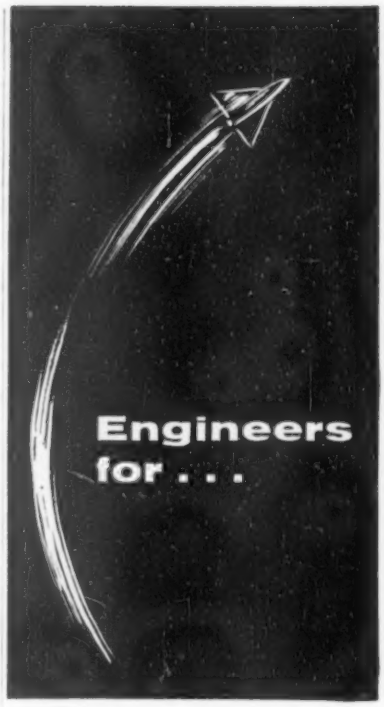

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EDITORIAL

A Sound Aircraft Industry

If there is much worry in the aircraft industry about our present military air policy, it is not discernible.

The aircraft manufacturers' own trade organization, the Aircraft Industries Assn., is authority for the statement issued a few days ago that the industry today "is better able to fulfill the nation's requirements for military aircraft than at any time since cessation of hostilities in World War II."

AIA says "the industry has been able to bring into production military aircraft of the highest quality, and to press development of revolutionary types upon which our national security will rely in future years."

It also emphasizes that while full strength and efficiency cannot be attained until 1957, our air arms "are equipped today with aircraft of unprecedentedly high performance," and notes that every combat plane now in production for our Air Force is a jet. All USAF fighter wings already are completely equipped with jet aircraft.

For every jet plane delivered to U. S. military forces each day in 1949, the industry now is delivering five.

AIA concedes that our early estimates of Soviet technological abilities "far underrated their true capacities," but contends that we still lead the Russians in airpower.

But we have no time to lose, as AIA undoubtedly agrees, and with the aircraft industry now in its soundest condition in years, it seems to us about time to consider an orderly stepup in those strategic research, development and production activities most necessary to increase respect and caution in the Russian bear.

The Sensible Happens!

The official invitation tendered by the Air Force to major U. S. airlines to help it test three manufacturers' six new turbopropeller transports is eminently good sense. It can speed the beginning of a vital new phase of commercial air transportation.

In striking contrast to some rather haughty attitudes of the past on the part of military people toward the commercial airlines, the meeting called by USAF last week with representatives of 12 airlines to discuss practical means for testing these revolutionary aircraft is a bold and sensible step toward making the most of the taxpayers' expenditures on experimental planes. Techniques and experience in these operations will be shared with industry, rather than hoarded under the old guise of "security."

The Air Force must find all the answers it can to basic questions about turboprop design, operation, maintenance and economics. So must the airlines.

As one hardened observer in civil aviation put it, this military-civil cooperation on new aircraft sounds like one of those projects that couldn't happen in Washington because it makes so much sense!

The airlines have much to learn from the Air Force invitation, and the military—we submit—will learn other facts it might otherwise not uncover for many months without the cooperation of the air carriers.

Those in the Air Force who are responsible for this program—and Assistant Secretary Roger Lewis is named among them by AVIATION WEEK's reporter—rate public commendation for an important idea.

Are Engineers Human?

One of our engineering writing friends exploded a few days ago.

"Do engineers really prefer to read Sanscrit by candlelight, just because it is difficult?" he asked.

"Does the average engineer, trying to keep abreast of new technical developments and ideas in his fast-moving field really enjoy articles more if they are difficult to read, hard to understand, and filled with differential equations?

"Or are engineers human? Are they like most people in aviation, long on things to read and do, and short on time?"

We on AVIATION WEEK think engineers are human. We have three full-time engineer-editors—more than any other aviation publication—so we think we can speak with authority.

Our engineers are always seeking out and finding new technical developments of significance in aviation, sorting out the chaff to save engineering readers precious time. We then describe these new technical ideas and developments in stories which are designed for quick and easy reading—usually months before they appear in the learned journals. (And there is a place for these learned journals, in the archives, for original research.)

Some folks apparently think that writing has to be difficult reading to be technical. We don't agree. We think engineers are human.

The Risk of Pioneers

Although Americans take justifiable pride in thoroughness of our aircraft accident investigations, especially involving airliners, we must note with some awe the enormous effort the British have exerted in their post mortem of the stricken Comet.

Every appropriate agency of the British government and industry was called into extraordinary service to trace minutely and with amazing patience and forbearing the baffling maze of theories.

The Royal Navy's achievement alone, in salvaging 70% of the wreckage of one Comet from the bottom of the ocean, aided by undersea television, is a brilliant story in itself.

The accepted theory of metal fatigue poses problems not only for British aviation—some of whose Comet 2s and 3s already are built and otherwise modified—but for engineers in the U. S. laboratories and industry as well.

The British authorities seemingly have blazed new trails in safety investigation and it seems likely that the lessons to be learned, and freely told, will serve aviation everywhere.

—Robert H. Wood

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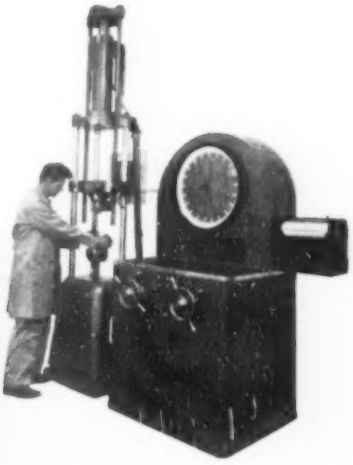

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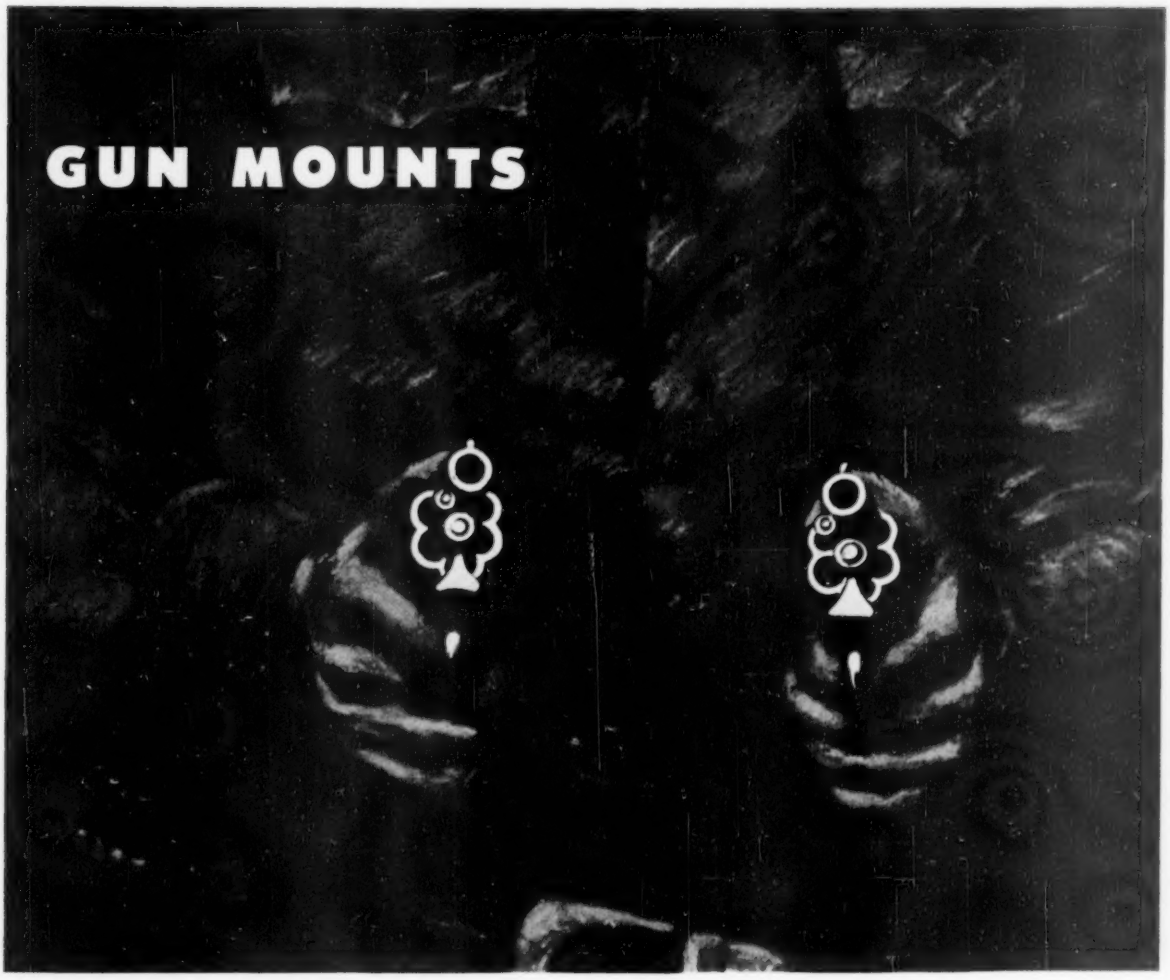

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